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## A STUDY IN FORMAL DISCIPLINE

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Is the issue over formal discipline dead? Certainly not. It was never more alive. Two out of every three teachers in the field believe in the doctrine. Educational literature fairly glitters with generalities which, if taken at their face value, seem now positively to assert, and again as positively to deny, this time-honored theory. For two opposite reasons the doctrine of formal discipline will never lose its hold on educational thought and life: first, because the truth in it is so vital, so far-reaching, and so evident to every generation; and, second, because the error in it is so subtle, so plausible, and above all so natural.

Three years ago I sent the following questions to a number of principals and Latin teachers in New England and the middle states:

1. Is the discipline derived from the study of Latin a general power serviceable in the mastery of other subjects? If so, why?
2. Is this discipline a preparation for all vocations? If so, why?

Seventy per cent. of the answers received were more or less emphatic statements of formal discipline. The following may be taken as samples. Answers to Question 1:

"Certainly the Latin students have acquired a greater power of concentration of attention, and this is of course most serviceable in the mastery of other subjects." "The study of Latin develops habits of accuracy, application, and thought." "Latin trains the memory." "Latin develops the powers of analysis, synthesis, and judgment."

## Answers to Question 2, summarized:

Latin is an excellent preparation for all vocations because it develops all the above-mentioned faculties: attentiveness, accuracy, application, memory, powers of analysis and synthesis, judgment, and thought.

The consensus of opinion, therefore, among the teachers reached by my inquiry might be summed up in the following concise statement of the doctrine of formal discipline: The study of a special subject (such as Latin) develops the powers or faculties of the mind, not simply for that special subject, but for any other subject, however far removed, and for any vocation.

This doctrine is held and disputed, not simply among the rank and file of teachers, but among the prominent educators as well. Not long ago a college professor said to me: "In the elementary and secondary schools it is of little consequence what the pupils study; the main thing is the discipline of the mind." This is the same thing as saying that mental discipline is general or formal in character, and may be developed from any special subject. A recent course of study for a New England city school system contains the following:

The application of these processes [i. e., of thought] to arithmetical problems is, under present conditions of school instruction, the most important work done in the school for the training of the logical powers—does more than anything else we do to teach pupils to think.

This statement clearly assumes the formal disciplinary position that thinking is a general power which may be developed in connection with a particular subject. Without multiplying illustrations, such prominent educators as the Committee of Ten, Fouillée, and Paulsen have emphasized the formal disciplinary side of education; while Presidents Baker and Schurman, and Professors De Garmo and Rein, have most emphatically opposed the doctrine.

Thus the issue, which, according to Compayré, became clearly defined by the middle of the seventeenth century, still lives and underlies some of the most important educational questions of the day. It appears in the controversy over the elementary course of study. This may be stated as drill on "the three R's" versus a broad and rich program. Shall the emphasis of the school be laid on exercising the mind in the time-honored gymnastics of arithmetic and grammar? Or shall the course present as completely as possible the elements of

all knowledge, and thereby introduce the pupil into the complete life of his day?

Again, the issue over formal discipline appears in the struggle of classical culture versus the training of the modern subjects, and in the claims of the prescribed versus the elective courses of study. The advocates of formal discipline maintain that there are no subjects that can approach the classics and mathematics in disciplinary value; hence they should be prescribed for all. Their opponents hold that the more modern subjects are more valuable as discipline and, for many pupils, are a better preparation for life; hence the principle of election should be recognized.

Again, the individual teachers are fundamentally interested in the great problem before us. Every teacher of a special subject wants to know what he may hope to accomplish on the disciplinary side. Every principal and superintendent wants to know the exact educational value of a certain subject in order to assign it its relative importance in the course of study. In short, there is no more important and interesting question in all educational thought than this question of formal discipline.

The object of this paper is therefore twofold: (1) to analyze the whole subject of mental discipline with a view to bringing something like definiteness, clearness, and order into a discussion too often indefinite, vague, and tangled; and (2) to describe an experimental test of formal discipline conducted by the Dartmouth Pedagogical Department.

1. *Analysis*.—In the first place, mental discipline may mean the acquisition of power to handle the facts of a particular subject. Through the study of mathematics one may gain power to handle mathematics. One's memory, discrimination, judgment, and all the other so-called faculties are undoubtedly strengthened for these particular facts. This is all very obvious and universally accepted. No one would doubt, further, that drill on one subject strengthens the powers for the mastery of a related subject. Mathematical drill may aid in physics or astronomy. To this extent and in this way the mind undoubtedly receives a general discipline through the study of a particular subject. But the question at once arises: Does not this general discipline extend also to unrelated subjects? Does not

mathematical drill strengthen the faculties for other subjects, whether related or not, as Latin, or Greek, or law, or medicine?

With this question we approach the very heart of the issue over formal discipline. At the same time we enter on vagueness and uncertainty. Nevertheless, an examination of the statements setting forth this doctrine reveals two general types of answers to the above questions. We will call these (a) the doctrine of faculties, and (b) the doctrine of general habits.

a) The doctrine of faculties is best understood by means of an analogy. Suppose one wished to develop one's power of lifting weights. He might exercise his lifting powers on dumb-bells, bags of grain, or anything else—it would make no difference what, provided these weights were adapted to the individual, and the exercise were taken regularly and properly.<sup>1</sup> After a time his general power of lifting would be developed, and then it would make no difference what the weight was; whether iron or stone or any other substance, he would be prepared to lift it. Now, in just this way, exercising any power of the mind, as the reasoning power, on a particular subject, as mathematics, strengthens that faculty for reasoning in any other subject whatever.

It is undoubtedly true that this form of the doctrine of formal discipline is widely held. When I have presented it in this shape to my classes, there has always been a good proportion of intelligent men ready to subscribe to it. It seems to make little difference that these men have had an elementary training in psychology; it is so wholly natural to look on the mind as possessing faculties in the manner described. In the second part of this paper, dealing with the investigation conducted by the Dartmouth Pedagogical Department, we return to the faculty theory. At this point all that is desired is a clear statement of the position. Yet it must not be ignored that the psychology of the present is absolutely opposed to the doctrine of mental faculties.

b) The doctrine of general habits is the second form in which formal discipline appears. Such a statement as the following is typical of the position: By the study of a given subject one develops

<sup>1</sup> The analogy fails here in that the advocates of this doctrine usually maintain that there are certain disciplinary subjects *par excellence*, as Latin or mathematics.

general habits of accuracy, discrimination, attentiveness, observation, and so on through the list.

Now, undoubtedly, through the pursuit of a special subject one does acquire general characteristics. It is a matter of common and indisputable experience that some men are characteristically accurate, or discriminative, or attentive; and it is equally certain that, however much they owe to nature, education has had a hand in making them so. The question therefore arises: Are these general characteristics truly general habits, or something else? It is one of the chief objects of this paper to maintain that they are not truly generalized habits, but the manifestations of an educated will.

At this point it may occur to someone to ask: What difference does it make what name you give to these general characteristics? Whether you call them generalized habits or an educated will, their reality as the result of education cannot be doubted. It makes a very great difference. In spite of the old adage, there is a great deal in a name. The name applied to a thing suggests how we are to think and act respecting that thing. If we call the general characteristics resulting from education generalized habits, the immediate suggestion for acquiring them is, drill. If, on the other hand, we call them the results of an educated will, the suggestion is, personality, tact, and teaching power. In the first case, dependence would be largely made on the subject; in the second, on the teacher and the co-operation of the pupil.

In maintaining the value of this distinction, consider first the possibility of a habit becoming truly general. Omitting the psychological and physiological considerations, let us take a concrete case. It is often maintained that we can form a general habit of accuracy. Now, a truly habitual act takes place without hesitation, without resistance, and without the guidance of consciousness. Suppose one who has acquired the habit of accuracy suddenly faces an entirely new situation. He has become accurate in mathematics; he now begins Latin. Accuracy in this new field requires sustained attention. In a new subject in which interest has not been developed this sustained attention must be largely voluntary—i. e., again and again the wandering attention must be called back by a conscious effort of the will. This involves constant hesitation, resistance, and the guidance of

consciousness. But this is not at all the working of an habitual process. Rather it is the manifestation of an educated will, i. e., the dominant purpose to become accurate in this new field, because accuracy is believed to be worth while.

But, though it is clear that the acquisition of accuracy in the new subject must be largely a matter of will, does not the habit of accuracy in mathematics facilitate the acquisition of accuracy in Latin? May it not be that way down deep among the cells of the nervous system the special habit in mathematics aids in the formation of those new nervous arcs which mean habitual accuracy in the new field? That indeed may be; but, because of our ignorance of brain physiology, such a theory must be regarded as a matter of extreme speculation. What common experience tells us is that the drill which leads to accuracy in mathematics may or may not establish in the individual's mind the value of the principle of accuracy. If this principle is established, a motive is furnished which leads to accuracy in other fields. If it is not established, but remains indifferent, no general characteristic of accuracy is formed. And, finally, if drill has made this principle wholly distasteful to the pupil, as may very well happen, a lasting evil has been done.

Instances of so-called general habits need not be multiplied. Each one, when analyzed, will be found similar to the case of the so-called general habit of accuracy. In short, it will be found no general habit at all, nor even the effect of one special habit on another; but, in so far as it stands for a general characteristic, it means an educated will—i. e., a principle of conduct established and made potent in the life of the individual. Indeed, such a principle may become so potent by many years of exercise, that, in the face of a new situation, it may determine our conduct with almost the speed and ease of a genuine habit.

This leads us to the all-important question: How is the will to be educated? Just here is where the value of our distinction lies. For the education of the will through the medium of any subject means more than mere drill. This is not to underestimate the importance of drills. They are indispensable. But to educate the will something more than mere repetition of exercises is required. This additional requirement is that the teacher shall inculcate some

general principle or motive of conduct. He must lead the pupil to pin his faith to this principle, and to set his heart upon it. Day by day he must strengthen it by the confidence which he inspires, and by pertinent suggestions, until at last it has become so potent or attractive that it will determine the conduct of the pupil in any field, however unfamiliar, and under any circumstances, however novel. This is the education of the will, and this is the sort of thing that the able teacher can accomplish through mathematics, or Latin, or manual training, or any other subject under the sun. In the past we have credited too much to the specific subject. We have emphasized mathematics as the great subject for training accuracy, or Latin for developing discrimination. It is high time to place the emphasis where it belongs—on teaching power.<sup>1</sup>

To be convinced of the truth of this position, one needs only to examine his own experience in an unprejudiced manner. Whence did we learn the lesson of accuracy, or discriminative judgment, or attentiveness? Was it from mathematics or Greek or Latin? Or was it from our wise guardian or teacher who early insisted on our being accurate, thoughtful, and attentive; who pointed out to us the ill effects from the neglect of these virtues and sometimes enforced his points in a way that clings to the memory still? Later, while studying arithmetic, what difference did it make to us whether Farmer A's sheep sold for exactly \$60, or for \$60.75? But when our respected teacher reproved us for our carelessness, and briefly showed us the importance of accuracy in real life, then the worth of that principle of conduct came home to us with keen emphasis and lasting power. Ever afterward, when we met a difficulty—and there were plenty of them everywhere—whether in mathematics, or Latin, or Greek, or anywhere else, it was those early lessons that gave us the will to overcome these difficulties and make of ourselves accurate men. One may well thank God for the difficulties that he must master to become strong; but he may thank God even more for those wise parents and teachers who have imparted to him incentives whereby he has been able to overcome them.

<sup>1</sup> Some subjects, it is true, lend themselves rather more readily than others to the task of enforcing particular lessons. For example, the subject-matter of mathematics is well adapted for the purpose of teaching accuracy. Yet mathematics does not of itself teach this great lesson—it merely furnishes convenient illustrations.

To conclude this part of the subject, let me restate briefly the position I have tried to maintain. In connection with the study of particular subjects, we do acquire general characteristics. These are not, however, general habits. Consequently mere drill on particular subjects is not the manner of acquiring them. They are, on the contrary, characteristics of the will, or established principles of action, and their acquisition depends largely on the quick sympathy of the teacher, the word of reproof, praise, or explanation in the right place and in the right manner, and on the power the teacher has by a word or suggestion to lay hold on the springs of action.

2. The second object of this paper is to set forth an experiment conducted by the Dartmouth Pedagogical Department.<sup>1</sup> This experiment was designed to test that particular doctrine of formal discipline which has been called, earlier in this paper, the doctrine of faculties. This theory maintains that there are faculties of mind which can be strengthened by exercise in one subject and thereby made stronger for the mastery of all. The exact question we set ourselves to investigate was as follows: Is there a reasoning faculty which, by exercise in mathematics, can be made stronger for other kinds of reasoning, as in law or business? Now, it is evident that if there is such a general faculty, individuals able in one kind of reasoning should be able in all kinds. As a matter of fact, just this point is maintained by many advocates of formal discipline. The professor of mathematics points out that the strong mathematical reasoners in college twenty years ago are now the great reasoners in law, medicine, or business. It was this position, so often emphasized, which suggested to us our method of investigation. Is this claim true to the facts? If so, what is the inference? If not true, what? On the answers to these two preliminary questions depends the validity of the whole investigation.

First, if it is true that the good mathematical reasoner is the good general reasoner, nothing is proved. For there are two inferences possible: (1) that there really exists a general power or faculty of reasoning; (2) that, while no such general faculty exists, the individual

<sup>1</sup> For the first suggestions regarding this investigation the author is indebted to Professor Paul H. Hanus, of Harvard University. For valuable suggestions and the greater part of the labor in carrying the experiment through, credit should be given to the members of the Dartmouth Pedagogical Department (1902-3).

has developed skill in reasoning along a number of different lines. This is entirely possible. One surely need not assume a general faculty to account for a person's being a skilful reasoner in law as well as mathematics. He has simply gained power by exercise along two independent lines. This second inference is so entirely possible that it destroys the certainty of the first.

On the other hand, if it is not true that the good mathematical, reasoner is the good general reasoner, a very definite thing is indicated, viz., that there is no general power or faculty involved; for obviously one cannot have a strong general power of reasoning and yet, in certain kinds of reasoning, prove himself comparatively weak.

The question of our test, then, is merely a question of fact: Is it true that the good reasoners in one subject are the good general reasoners? Or, more specifically, is the good mathematical reasoner the good reasoner in every-day practical affairs, and in law? In the attempt to answer these two questions, the following investigations were set on foot.

First, two test-papers were prepared, one containing originals in geometry and the other questions in practical reasoning. The following is one of the sets employed:

#### TEST IN GEOMETRICAL REASONING

1. Prove that the bisectors of the interior angles of a trapezoid form a quadrilateral, two of whose angles are right angles.
2. The bisector of the exterior angle at the vertex of an isosceles triangle is parallel to the base.
3. If the bisectors of the equal angles of an isosceles triangle meet the equal sides at  $D$  and  $E$ , prove  $DE$ , parallel to the base of the triangle

Note to instructor: You may substitute for any one of the above problems any problem you think best. The pupils may use their books in looking up reasons. Make your own time limit. Stop all work at the same time.

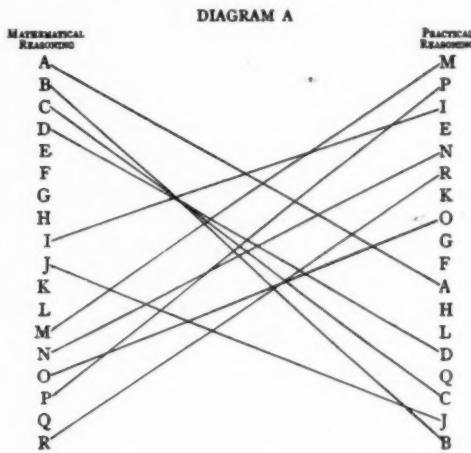
#### TEST IN PRACTICAL REASONING

1. Give all the reasons you can why a high-school education is a good thing.
2. Why should the town rather than the parents pay for the education of its children?
3. Which is of more value, physical or mental training? Give all the reasons you can for the position you take.

Note to instructor: Make your own time limit. Stop all work at the same time.

These tests were submitted to twenty-four different groups of high-school pupils. The students of each group belonged to the

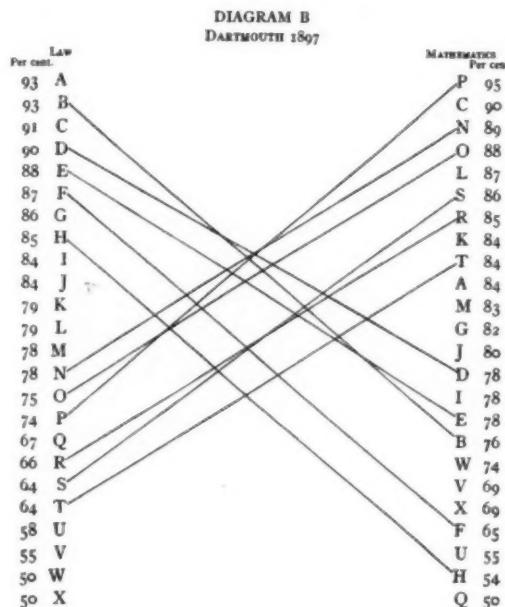
same class and were on an equality with respect to mathematical preparation. Each group took both tests. The results of these tests were carefully corrected and the pupils of each group arranged in two series, the first according to their ranking in mathematical and the second according to their ranking in practical reasoning. The following is an example of a group arranged as described:



A glance at this table shows a striking lack of parallelism between the two series. A, B, C, and D, the leaders in mathematical reasoning, stand well down toward the foot in practical reasoning, while M, P, N, and R, weak in mathematics, are among the strongest in practical reasoning. Precisely this striking result is discovered in the other twenty-three tests. If we take the first five mathematical reasoners from each of the twenty-four groups, we have in all one hundred and twenty pupils most excellent in mathematical reasoning. Of this number seventy-six, or 63 per cent. are at the foot of the practical reasoning series, conspicuous for their inefficiency in practical reasoning. Of the number of pupils at the foot of the practical reasoning series, fifty-seven, or 47 per cent., are conspicuous for their position at the head of the practical reasoning series.

As a supplementary test, and one precisely the same in principle, one man examined the records of Dartmouth students who had

taken mathematics and certain law courses which required a good deal of reasoning. The records for ten different classes were examined, and tables were formed as in the previous test. The following is an example:



The results of this test were found to be strikingly parallel to those of the earlier test. Fifty per cent. of the best students in law were conspicuous for their poor showing in mathematics; and 42 per cent. of those poorest in law stood at the head of the series in mathematics.

These tests are surely convincing of one thing, viz., that students able in mathematical reasoning are not even generally able in practical reasoning and law. And, by an allowable inference, persons able in one kind of reasoning are frequently not able in other kinds. But once having established this point, the whole theory of faculties falls to the ground, and with it the stronghold of formal discipline. From the fact that 60 per cent. of those best in mathematical reasoning

were correspondingly weak in practical reasoning, the conclusion is inevitable that no faculty is involved. The reasoning faculty is a myth. But if the reasoning faculty, why not the other so-called faculties—perception, memory, imagination, observation, and the rest? They are all alike in that they have no concrete existence, but are merely abstract names, convenient for descriptive purposes, but no more capable of doing anything, as perceiving or remembering, than abstract beauty can beautify or singing in general create a song.

In conclusion, let me briefly state once more the conclusions from this short study of formal discipline: (1) The doctrine has a core of truth attested by ages of experience. (2) Training the powers of the mind in one subject strengthens them for handling another in so far as those two subjects are related. (3) The vague doctrine of faculties or general powers is condemned by psychology and disproved by common experience and experimental test. (4) Through the pursuit of a particular subject, the will may be educated so that one may become characteristically accurate, observant, or attentive. But this training depends, not upon the content of a particular subject, but upon the all-important factors of personality, tact, and teaching power.

## THE QUESTION OF TRANSLATION IN THE TEACHING OF MODERN LANGUAGES

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The controversy over the reform of modern-language instruction that has been raging in Germany for the last three decades doubtless centers about the question of translation. The importance of translation in the whole movement is so manifest that it may be justly considered the criterion for classifying the various methods. These may be grouped according to their relation to this question as follows:

1. The Grammatical or Translation Method according to which the instruction is carried on exclusively in the native language of the pupil.
2. The Direct Method, which for the most part employs the foreign language in the classroom and dispenses as much as possible with translation.
3. The Method of Compromise, which, though advocating the use of the foreign language as vehicle of instruction, does not reject the translation.

The translation question, as we shall see, cannot be exhaustively treated without entering upon the subject of essay-writing for which the use of the foreign language in class is the prerequisite. So our topic is identical with the discussion of the three methods named above. Let us therefore see in what light these methods appear to us today, after the close scrutiny to which they have been subjected in Germany.<sup>1</sup>

### I. THE CONSERVATIVE, THE CONSTRUCTIVE, THE GRAMMATICAL OR TRANSLATION METHOD

This method is based on that of instruction in the classical languages in which grammar was not made a means of learning, but

<sup>1</sup> Vols. IX and X only of Vietor's *Neuere Sprachen* were at the disposal of the writer of this article.

was treated as an end in itself. This at once relegated the spoken language, if not to the background, at least to a secondary place. The study of grammar was to stimulate and train logical thinking on the part of the pupils. As to the method of procedure: First came the rules; for just as in the language the grammar was of prime importance, so in the grammar the rule was pre-eminent. Nor was the pupil trained to formulate this rule from the language itself; on the contrary, he received it ready-made from the teacher. Such an abstraction presented to the pupil was often incomprehensible and, being thrust upon him, became hateful, or at least remained a matter of indifference to him. With his awakened activity the suffering of the student began. He was obliged to apply this rule to numerous disconnected sentences which in their isolation were often devoid of all human interest. Now grammar, as we all know, is a large collection of such isolated facts, all of equal dreariness to the youthful mind. No wonder he resisted. Recourse to drill became therefore a necessity—drill in memorizing and in never-ending translation. Of what educational value was such a proceeding? The committing of rules had value only as memory drill, not more valuable, for instance, than the memorizing of all the animals or plants of a certain species. To be able to judge of the benefits to be derived from translation let us first see clearly what we are to understand by the term "translation."

Usually one speaks of translation from or into a foreign language. This classification is justifiable. But for our purpose let us rather take the following: (1) actual translation, which for brevity we will call transmission; (2) paraphrasing or reproduction in the foreign tongue.

What can be really translated? The strictly mathematical? But are sentences which express so general a truth as  $3 \times 3 = 9$  in German, English, and French still transmissions? Everyday occurrences? But is not the colloquial language especially full of idioms of all sorts? Or perhaps the purely physical? Here also our answer must be: "Sometimes, perhaps often, but by no means always." Let us take, for instance, that well-known instrument called by Germans *die Schere*, by Frenchmen *les ciseaux*.<sup>1</sup> In German it is

<sup>1</sup> *Kunsterziehung (Deutsche Sprache und Dichtung)* (Leipzig: R. Voigtländer, 1904), p. 255.

that which cuts, the purpose of the thing creating the word; in French the two chisels or blades which act upon each other—the form—has given the instrument its name. This example (a paraphrase) shows that verbal and actual translation are not identical, hence the possibility of verbal translation is not a characteristic of transmission. The difference between transmission and paraphrase lies deeper; it is not of an external or formal nature, but on the contrary, arises from the diverging view-points of different peoples, which naturally are the more diverse the greater the fundamental difference between the nations. This divergence may appear in the individual word as well as in the phrase, in the simple sentence, or in the complex sentence structure. In the last case, transmission may be possible, though more frequently paraphrase is demanded since more is expressed here than in the word or simple sentence, and the divergence of the view-points of the different nations is apt to become more apparent.

To return from this brief excursion into the nature of translation to our Grammatical or Translation Method. Identity in the conception of the thought underlying the phrases in both tongues admits of an actual translation (or transmission). In this way the German pupil conversant with the rules could, for instance, transmit the sentence, "Tapfere Männer waren die Römer," into correct Latin just as he could transmit, "Der Gesang der Vögel verkündet die Wiederkehr des Frühlings," into French, or even the statement, "Wir wissen, dass die vereinigten Völker Europas Napoleons Macht brachen," into English. This kind of translation is logical and pedagogically sound. If it fits into the method in use, it may continue to exist as the expression of the much-praised disciplinary element of the Grammatical Method. There is no doubt, moreover, that the student did learn grammar by this method; only, as has been hinted above, the thing was overdone. Useful mental drill degenerated into mechanical mental gymnastics. And still worse, the student was expected to pursue this method where it became an impossibility. He was also told to transmit where he should have paraphrased. Where it was a question of remodeling the expression, of expressing the thought in a foreign medium picturing the world in a manner unknown to him, the purely constructive proceeding was

bound to fail, however sure the student might be of his grammatical rules. And most translations demand just such recasting of form, of thought, of feeling. We cannot emphasize often enough that such a process demands a considerable control of both languages, and that frequently even the trained philologist fails to accomplish it, unless, indeed, he possess some of the traits of the artist. It is well known that only a poet can translate a poet. But if any teacher believes that grammatical knowledge alone will suffice to translate elevated prose, let him set his most advanced class to translating Washington Irving or any other American classic. He will soon see his error.<sup>1</sup>

Lack of recognition of this truth brought about, not only too intensive an application of the Grammatical Method, but also too long a continuation of the same. Disgust and weariness were the natural consequences. This feeling extended to the entire language, and even to its literature. The student drew a sigh of immense relief when all was over, and hastened to get rid of his books at the first opportunity. Of his own volition, he returned to his classical studies but rarely, at least not until much later in life.

It is with a definite purpose that we employed the past tense in the above description; for we hope that in the application of even the Grammatical Method instructors of today have grown more humane and more reasonable. Assuming now that a wiser application of the method should no longer challenge radical condemnation, but should rather awaken a real interest in the mind of the student and give him a thorough knowledge of grammar, what objections would still remain to this method?

1. Grammar ought not to form the nucleus of instruction.
2. Although a thorough knowledge of language is not possible without an insight into its grammatical structure, on the other hand, a grasp of all the rules of grammar by no means insures command of the language.
3. The purely formal method of instruction is one-sided, and can, therefore, not be the best method for inculcating a knowledge of the language.

<sup>1</sup> It will doubtless be evident that this article was not originally written in English

4. Since the first step of this method (deduction instead of induction) is unpsychological, and the second (constructive translation) often does violence to the spirit of the language, this method lacks a scientific basis.

We further defined the Grammatical Method as one in which instruction is given exclusively in the mother-tongue of the learner. This is inevitable with regard to the classic languages. Moreover, the numerous inflections, the difficulties of construction, the order of words in the sentence, the great divergence of expression, demand translation into the mother-tongue; except perhaps in the most advanced classes. In dealing with modern languages the matter is very different. Whether it is here advisable to retain the translation into the learner's language, or to make the new language a means of instruction, we will examine in another section.

## II. THE DIRECT, THE REFORM (OR THE NATURAL) METHOD

This German Natural Method is not to be confounded with the so-called Natural Method of America. The latter, by no means without merit for the development of language instruction in this country, arose out of legitimate reaction against the one-sided classical method, and, going to the other extreme, became as one-sided as that against which it rebelled. In it little or no grammar is taught, and, in place of logical training, merely external devices are substituted—cultivation of the ear and of memory. Mainly because of this error, the whole structure breaks completely down at the end of the first year. The Reform Method of Germany does not exclude grammar; yet it does not, like the Old Method, proceed deductively; it does not precipitate difficulties upon the unprepared student; nor does it make grammar the idol to which all else must bow down. It runs parallel with the American Natural Method as far as this proves itself wise: knowing that with the child imitation precedes reasoning, this method, in the early stages of instruction, advocates unconscious absorption of the foreign forms. For this purpose the use of the new tongue in the classroom is the best means, while grammar is taken up cautiously and by degrees. All grammatical phenomena that can be observed in examples and impressed by imitation are best left without theoretic abstraction. For, in this

method, grammar, as a theory of word-formation and sentence structure, has as little excuse for being as has pronunciation as a theory of sound-production. When theoretical grammar is introduced, it is only in case of important and frequently recurring forms. Method of procedure may vary according to the age of the pupil, but it would hardly be possible to do away with the rules altogether. When the rules are taken up, they are always to be derived inductively from the text, thus becoming of interest to the student as a discovery of his own, as well as serving to develop the logical faculties. Practice, however, is necessary to put him in actual possession of the rule. The manner in which this practice enters in will be discussed later. If the teacher can carry it on in the language taught, three desirable ends are attained with one effort: the rule is fixed, the vocabulary is enriched, and the feeling for the language is deepened. The rule itself may be formulated in the foreign tongue, and be thus committed to memory, though objections might be raised to this as being too closely allied to the Old Method.

Thus this method by holding fast to grammar avoids the danger into which the American Natural Method fell—of making impossible demands upon the memory. From the Old Method it differs mainly in that grammar becomes only a means to an end, not an end in itself.

In the New Method reading fills the place that grammar formerly occupied. This reading, the center of gravity of the new instruction, consists of selections from texts chosen to give the student insight into the peculiarities of the foreign sentiment and expression as differing from those of his own compatriots. Thus the ideal of instruction has changed. In place of the thorough grasp of the grammar which formed the *summum bonum* of the old régime, the new evangel preaches a concept of the foreign land and people, a knowledge of their life and customs, of their social and industrial problems, and also of their spiritual aspirations. We cannot go into the details of the manner of carrying out this method in Germany by means of maps, illustrations for culture-history, facsimiles, and other "object-lesson" materials. We need only emphasize that these results can be obtained only if the student is taught to understand the foreign idiom perfectly; that is, if he can read, write, and, if possible, speak it readily. The final goal may to some seem too far removed for

actual realization, but all must agree that this threefold familiarity with the language is essential.

If for a moment we waive the question of speaking the language, and if we grant that the Old Method succeeded admirably in inculcating an intelligent reading of texts, the question of writing the foreign language still remains. The only method available to the old school is evidently to start from the translation. In the first part of this article we reduced the legitimate claim of translation to transmission, which leaves only a very small remnant of the formerly broad field of translation. But even granting that our premise be false, it still remains irrefutable that every kind of translation leads necessarily away from the foreign idiom and back to the starting-point—the mother-tongue. Experience fully proves this theory. It is possible to study vocabularies for years, to translate volumes, to understand the grammar perfectly, without attaining the ability to handle the foreign tongue freely. Whosoever doubts this may be asked to explain, for instance, why in the German *Gymnasium*, in which Latin is drilled from the *Sexta* up, the Latin essay in the *Prima* was so complete a failure that it had finally to be discontinued. A pupil trained wholly by translation cannot free himself from it. The more thoroughly he has been drilled, the more it has become part and parcel of himself. He always conceives the thought in his mother-tongue and translates it either mentally or on paper. For there is no bridge leading from translation to free, natural expression. The American Natural Method recognized this fact and early introduced the free written expression as a continuation of the free oral one. The fault of this method has been mentioned above—the total neglect of grammar. It must further be criticised in that its procedure was not sufficiently slow or methodical. The result was often exercises bristling with mistakes, which drove the conscientious teacher back into the clutches of the Grammatical Method.

The Reform Method starts with the tenet that speaking and writing a foreign language are essentially the same thing. Both are attainable only by temporarily leaving the ground of one's own language and entering into the spirit of the foreign tongue. Speaking and writing arise from the same source and are by their nature inseparable. Hence fluency of speech, that is not grounded on prac-

tice in writing, is not thorough, neither can facility in writing be secured without practice in speaking. Language being primarily a spoken medium, oral practice should precede the written; that is, in the detail of instruction, not in the general plan. Speaking and writing being one, the two must be discussed together. Before proceeding, we will once more emphasize the fact that the ability to speak is to be considered only as a means to an end—i. e., to the penetration of the intellectual content of the language—and not an end in itself. If, therefore, readiness of speech in the foreign tongue cannot be attained in the classroom, this is no argument against the use of the foreign language during instruction.

We mentioned above that this method tends to accustom the pupil early to the use of the other language. The best beginning is by means of object-lessons, using picture-books and cards. The teacher pronounces and explains for the class; the pupils imitate him. Then follow questions on the part of the instructor, answered (also in the foreign tongue) by the student. Soon the pupil will be able to put questions which are to be answered, at first by the instructor, later by other pupils. Next easy, connected texts may be used which are modifications of what has been learned orally, thus avoiding translation. The teacher should read each passage, repeatedly and with great distinctness, insisting upon the pupil's imitation with correct pronunciation and emphasis. The practicing of difficult foreign sounds, while necessary, should not be carried to excess; it should preferably be done when the pupil may himself see its necessity. The reading-lesson should be discussed between teacher and pupil as was the object-lesson. A word of explanation in the pupil's own mother-tongue, when it seems necessary, is not to be prohibited, as a clear understanding is never to be sacrificed to method. Such an occasional word at any period of the instruction may save much time. In other words, the teacher should remain the master, and not become the slave, of his method. So long as he does not allow the language used to deteriorate into an irritating mixture of the two tongues, and keeps the center of gravity always in the new language, the mother-tongue will gradually and imperceptibly disappear with the advance of the pupil.

Although this method strives from the very start to avoid transla-

tion, the fact nevertheless remains that the student at first associates each foreign word with its familiar equivalent, and not directly with the object which it represents; even at the sight of the picture the familiar word will arise, and not the newly acquired one. But skilful instruction, some self-control, and a gradually acquired habit will soon enable the student to skip the first mental process, just as one living abroad soon speaks without translating. Above all, in the beginning the spoken exercises must not be too difficult. As long as the student's entire attention is centered upon the form, the thought must be simple and clear. But if his ear be at all trained, and if he be encouraged by his teacher, he will soon be able to advance even to abstract ideas. Mental arithmetic, for instance, can be introduced very early with excellent effect.

Hand in hand with each oral lesson should go a "short" written exercise. This should be identical in substance with the oral one, so that the student will write or speak with equal ease. Nothing would be more illogical than, after half a year of purely oral work, to confront him suddenly with a lengthy written task; he must himself realize that speaking and writing are one. As it is not our purpose to follow the pupil through every step of his development, we will merely note that he is not to escape grammar completely. Grammar is essential for elucidation and fixing of that which he has already learned conversationally. Nor need his grammatical knowledge be inferior to that attained by the students instructed according to the old Grammar Method. The well-known fact that a student can rattle off a rule which he does not know how to apply correctly will undoubtedly be less frequent under the new régime.

We have herewith, we hope, outlined the plan of the Direct Method, and, for the sake of clearness, touched upon a few details of execution. In closing we shall mention the most important devices which those who favor this method recommend:

1. To aid acquisition (the training of the eye at the expense of the ear, so prevalent in modern education, is here the greatest difficulty to be overcome): loud, distinct, and careful enunciation and perfect pronunciation in speaking and reading on the part of the teacher as well as of the student; correct emphasis; correct use of the organs of speech; home practice in oral reading; concert work in class; the

reading aloud of interesting stories by the teacher or an advanced student (an excellent exercise to further quick grasp of the spoken word), dictations, memorizing of short poems and prose selections, conundrums, charades, rebuses, and similar material, singing of foreign songs in the singing class, playing of national games; stereopticon lectures on the foreign land; recitations and addresses by natives; school dramatics.

2. To assist reproduction (spoken and written): picture charts and other objects; readers containing the vocabulary of daily life; oral and written exercises in questions and answers; copying in the foreign language; alteration of matter read (e. g., with change of person or tense); oral or written reproduction of what has been heard, seen, or read; brief extracts of tales read or heard; giving prose versions of poems; independent description of an object or picture at hand; retroversion; reading-matter taken from modern literature; reading at sight; free description of events of student's own experience; letter-writing; international correspondence of pupils; free invention in the foreign tongue; essays; dramatic dialogues; discussions; school editions with annotations in the foreign tongue; monolingual dictionaries (giving the foreign definitions or synonyms instead of translations).

This list is somewhat heterogeneous, mainly because this method has not yet been carefully worked out in every detail. One thing is, however, evident: the reformers demand considerable material for instruction. Whoever in this country has not such material at hand must largely manufacture it himself, for in America so far very little provision has been made for this sort of work. He must consider carefully what he is undertaking before he tries to apply this New Method.

### III. THE COMPROMISE METHOD

This we can treat more briefly. In common with the Reform Method, this method holds that a person practiced in speaking and writing a language has a much more fluent and intimate understanding of the printed page than he who associates no living sound with the written symbol. Nor does it dare reject the claim for a practical mastery of the language, since this—whether on ideal or practical

grounds—seems to be the demand of our present age. But since such an attempt is in danger of furthering a merely superficial training, an intellectual chattering instead of a really cultural influence, it fears lest the new method should underestimate the value of grammar and overestimate that of ready speech, as the old one erred in the opposite direction. Nevertheless, this Compromise Method favors the use of the foreign language in the classroom.

In human society there will always be people who prefer the golden mean, especially when—as in this case—the end to be attained is so complex. We saw that this end really means nothing less than the introduction of a young student into the culture ideals of a foreign land, as these are represented in its language and literature. Moreover, as we still await the clarified and accepted statements of views as to the best method of attaining this end, it is not surprising that the official curricula of the secondary schools of Prussia still cling to the Compromise Method.<sup>1</sup> But here, as always, compromise shows its inherent lack of vitality by being without initiative force; it, furthermore, incurs the danger that, in the effort to unite discordant aims, nothing rounded and perfect will be accomplished. It falls between two stools. This danger seems especially imminent when we reach the subject of translation.

In our observations the question of translation into the student's native tongue has thus far not been considered. Let us now take up the discussion from this point of view.

Everyone will admit that a student cannot translate a foreign text until he has understood it; otherwise he translates incorrectly. Then the question may be raised: What is the object of translation? Why is not mere understanding sufficient? A twofold answer is given. It is claimed that the student perfects his knowledge of his native tongue by translating into it. This may be partially true, but one thing is sure: he ruins his own style through the usual wholesale translation. At this period of his development his salvation lies in the careful keeping apart of the two tongues, so that his own stylistic individuality, which is still in a formative stage, be not contaminated. How many classroom translations from Cæsar are well

<sup>1</sup> *Lehrpläne und Lehraufgaben für die höheren Schulen in Preussen* (Halle a. S.: Verlag der Buchhandlung des Waisenhauses, 1901). See, e. g., pp. 41 ff.

rendered into English, or into any other civilized language? Is the foreign resident, who always has the two modes of expression at hand, distinguished for purity of style in either one? Has not often even learned translation worked havoc at home? Let him who would realize what a good translation costs look up what such a master of language as Luther thought of translating. He will be surprised to find how desperately he had to wrestle for adequacy of expression in spite of all the painful hours spent in preparation for his task.

Secondly, it is asserted that translation is necessary to a judgment of the student's accuracy of understanding. There are two things that present difficulties in translating—the form and the content. In a method which eliminates translation it is more than ever necessary that the texts presented be adapted to the capacity of the student. A motto of especial value to American teachers would be, "Better too easy than too difficult," at least as long as the student is still struggling with the form. Moreover, the modern languages are much more simple in inflection than the classics, and the ideal Reform Method presupposes graded readers. Simple and carefully graded reading-material will reduce the number of uncomprehended passages, and such as still remain will be easily discovered by the instructor teaching in the foreign tongue. The pupil's manner of reading the passage aloud, his assurance, his intonation, etc., display his grasp of the meaning. In doubtful cases the teacher can easily discover, by means of questions in the foreign tongue, whether or not a special passage is understood. In extreme cases the mother-tongue may finally be resorted to. Even the most radical Reform Method would be guilty of no inconsistency in this, for teaching is an art, and as such should at necessity be free to soar above methods and theories.

For reasons developed above, we are still less favorably impressed with a method which clings to the translation "into" the foreign idiom. We saw that such translation is antagonistic to free natural expression in the foreign idiom; the two cannot be yoked together. In the secondary schools of Prussia either translation or essay-writing may be demanded of the graduate according to the decision of the *Provinzialschul-Kollegium*.<sup>1</sup> Hence, at the tenth *Neuphilologentag*

<sup>1</sup> *Ordnung der Reifeprüfung an den neunstufigen höheren Schulen in Preussen* (Halle a. S.: Verlag der Buchhandlung des Waisenhauses, 1902), p. 6.

at Breslau<sup>2</sup> attention was called to the fact that an insistence upon translation would annul all concessions made to the Reform Method. Doubtless the above regulation will be properly modified, for even if logical, it would be practically impossible. The New Method of modern-language instruction makes such great demands upon the teachers in any case that the premature aging of the latter has been advanced as an argument against the method. The foolish double demand would wear out even the strongest physically and mentally. In accordance with this fact, the German entrance examinations of the University of Chicago demand no translation of the student whose training has been according to the New Method, and no essay of one who has been trained according to the Old. In its own practice, the German Department stands for the independent use of the new language, hence opposed to translation. In France translation into the foreign tongue has been done away with completely.

The Compromise Method, it is true, obtains the rule by induction, but sees in translation the best means of putting these rules into practice. We believe that translation is mainly paraphrasing into the new tongue, and, as such, demands too intimate a knowledge of the latter to be used successfully the first years. Only a method which puts at the disposal of the student what is temporarily necessary of such knowledge can be looked upon with favor. This is true of "retroversion," and by this means we desire to drill our pupils in the grammatical rules. For the American student this means changing an English text into German, which in its place is an altered version of a German text with which he has first acquainted himself thoroughly. Both, the German original as well as the English version, lie before the student. The English text differs from the German sufficiently to exclude mere copying. The German text complements the student's insufficient knowledge of the foreign idiom, and enables him to produce a paraphrase. Moreover, by this method he is not driven back to his mother-tongue as a model, and the *circulus vitiosus* of paraphrasing, as it used to be done in the lower classes, is broken. So retroversion is not opposed to free expression. Since it contains both elements, the latter as well as translation, it is a compromise of

<sup>2</sup> *Die Neueren Sprachen*, Vol. X, pp. 225 ff.

the Old and of the Reform Method, and therefore has been discussed by us at this point. According to our view, it is the only good feature in the Compromise Method.

We have, then, felt compelled to decide against translation and in favor of the Reform Method, but have not failed to call attention to the fact that much remains to be done before the New Method can be consistently carried out. Therefore, whether willing or not, we may still often be forced to compromise. May the transition period, however, be brief, and may we not lose sight of our ideal, so that the fundamental truths of the reform may speedily and permanently be realized.

## THE MEASUREMENT THEOREMS IN GEOMETRY

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In the presentation of the idea of measurement in geometry there are two difficulties. One arises from the necessity of treating incommensurable quantities; the other is due to the totally unpractical point of view from which the subject is approached. The beginner in the study of demonstrative geometry has no knowledge of incommensurable quantities until they are spoken of in connection with this subject; he has trouble in realizing the nature of the obstacle he is being taught to surmount. As to the other difficulty, that the treatment of measurement in geometry is unpractical, remember that the pupil has already computed areas of rectangles, and that in general he has had practice in the numerical estimation of a great many different kinds of quantity. In all such practice he has learned to compare quantities by means of the numbers that represent them, and he perfectly well understands that these numbers are obtained by comparison with standard units, or with fractions of those units that are obtained by a standard scheme of subdivision.

In his study of geometry, however, this knowledge is of no use to him. He is given a pair of rectangles, first with equal bases and then without, but having no relation whatever to a standard unit; he is taught to compare them by a cumbrous method, especially invented for the purpose, and having apparently nothing to do with measurement as he has known it and as everybody knows it. After he has worried through this, he learns that if one of his rectangles degenerates into a unit square, his investigation has proved that the area of the other rectangle is the product of the lengths of its sides; and this, the main object of his work, instead of being the center of his interest, comes in as an anticlimax.

The unsatisfactory results of these methods are well known; perhaps they are unavoidable. It seems worth while, however, to try a

method in which the pupil will not have to accept the existence of incommensurable numbers before entering upon the line of investigation that explains their origin; in which he investigates measurement in geometry just as he would practice it with the instruments of the carpenter, the engineer, or the astronomer; and in which thorough-going proofs are given of the central facts of measurement, by direct attack and without any sacrifice of validity.

The theorems in elementary geometry that form the logical basis for the recognition of a correspondence between number and geometrical magnitude are these:

A central angle is measured by its arc.

A diedral is measured by its plane angle.

The area of a rectangle is equal to the product of its base and altitude.

The volume of a parallelopiped is equal to the product of its three dimensions.

On the other hand, the practical basis for this recognition is experience in measurement. The measurement of an angle with a protractor, and of floor areas with a tape or a yard-stick, leads at once to associations of number and magnitude—associations that are familiar to every pupil, a part of the mental stock in trade which the teacher of geometry should utilize, if possible. It can be utilized, without any sacrifice in mathematical rigor, and with some advantage in directness, in the demonstration of the four theorems referred to above.

In the preliminary study of the measurement of a straight line, emphasis should be laid on the measurements of the engineer, rather than on those of the carpet-man. The exactness obtainable by great care, the use of verniers, micrometers, scale-reading microscopes, the allowance for temperature, the devices for keeping a measuring-tape under constant tension—all these things will add interest to such a simple topic as the approximate measurement of a straight line. They will also tend to fix in the pupil's mind the decimal scales of measurement, which will be a further advantage in the effort to associate number with magnitude.

This limitation to decimal numbers furnishes an introduction to the study of incommensurable numbers. In the entire series of decimal numbers, infinite though it is, from 0 to 1, there is none that is exactly equal to  $\frac{1}{3}$ ; and in the entire infinite series of distances obtained from the unit by decimal subdivision, there is none that, repeated

three times, will give the original unit. It is, however, easy to find two numbers, each with its corresponding distance, one larger and the other smaller than the number sought, and differing from each other by an amount smaller than any assigned number, however small that may be; and the corresponding distances will also be one larger and the other smaller than the required distance; moreover, they will differ from each other by an amount smaller than any assigned distance, however small that may be. Consequently, although with our limitation to decimals we cannot actually identify this required distance and its corresponding number, we can come as close to it, from above or below, as we choose; that is, we can find a distance, and a corresponding number, which differ from those required by less than  $\frac{1}{n}$  of the unit, where  $n$  is any assigned power of 10 whatever.

The two theorems upon which is based the measurement of angles and arcs are these:

In equal circles, if two central angles are equal, their arcs are.

In equal circles, if two arcs are equal, their central angles are.

As we measured distances by successive applications of a standard distance, so we measure arcs by successive applications of a standard arc, and angles in the same way, using for a standard angle the central angle that intercepts the standard arc. From the theorems above it is evident that for arcs that can be exactly measured by the degree, which serves as a unit, or by its subdivisions (minutes, seconds, and decimals of a second), the number that represents the size of the angle is identical with the number that represents the arc.

As in the case of a rectilinear distance, it is further evident that there are arcs (for example, one-seventh of a quadrant) which are not represented by any number in the infinite series of numbers that can be obtained by decimal subdivision of the second, however far that subdivision may be carried. And as in that case, one may obtain an arc which differs from the required arc by less than  $\frac{1}{n}$  of a second, where  $n$  is any stated power of 10, however large. This arc, and its angle, are represented by the same number; then the required arc, and its angle, are represented by numbers which cannot differ by any stated amount, however small.

The same argument can be applied to any incommensurable arc, and its angle; for example, to the arc equal in length to the radius. The advantage of applying this argument first to arcs that are commensurable, though not decimaly expressible, is that with this plan it is not necessary for the pupil to accept at the beginning such a radically new idea as incommensurable number.

The conclusion, that an arc and its central angle are expressed by the same number, is briefly stated thus: A central angle is measured by its intercepted arc.

Precisely analogous treatment is given to the theorem about dihedrals (and lunes).

The area of a rectangle, in the case where the lengths of the sides can be exactly measured by the unit of length or by any of its subdivisions, is evidently the number that represents the product of the number of squares in a row by the number of rows, divided, if necessary, by a number that represents the extent to which subdivision is carried. In order that the fractional unit-areas may be squares, it is necessary for each side to be expressed to the same number of decimal places (using ciphers if necessary). If the sides of a rectangle, for example, are 2.150 and 4.325, the area will be represented by the number of squares of area 0.000001 of the square unit.

Rectangles may be found of which the sides cannot be expressed by a number of the decimal system. Measuring two sides from the same corner, and drawing parallels through the last mark of exact measurement, a new rectangle is obtained the area of which is exactly expressible by a decimal number which is the product of the numbers that express the lengths of the sides.

This new rectangle we will call the *approximate rectangle*, and the length numbers of its sides we will represent by  $x$  and  $y$ ; the length numbers of the corresponding sides of the original rectangle, whatever these numbers are, we will represent by  $a$  and  $b$ . As we have seen, the values of  $x$  and  $y$  may be made to approach as nearly as we please to  $a$  and  $b$ .

However far we carry our decimal subdivision of the unit of length, the approximate rectangle will differ from the original rectangle by a strip which extends around two sides of the rectangle, and which has

a width less than  $\frac{1}{n}$  of the unit of length. This strip we may call the *error of area*.

In the accompanying diagrams, Fig. 1 represents the approximate rectangle divided into squares each side of which is  $\frac{1}{n}$  of the unit of length. The error of area is represented by a shaded band. In Fig. 2 the error of area is straightened out, so as to show that it is less than a rectangle whose length is  $x+y+\frac{1}{n}$ , and

whose width is  $\frac{1}{n}$ . The pupil will need

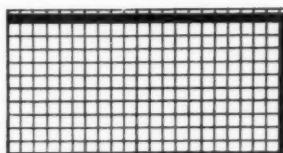


FIG. 1

to be cautioned against the mistake of considering the error of area as necessarily of uniform width. This caution may be emphasized by magnifying the diagram: for example, Fig. 3 represents Fig. 1

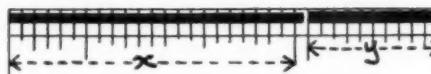


FIG. 2

magnified  $\times 4$ , and the difference in width between the two strips is obvious. Fig. 4 is a similar enlargement of Fig. 2.

There is a strip of uniform width contained between the approximate rectangle and another rectangle, formed by drawing parallels through the next measurement marks, outside the original rectangle. This strip has an area  $\frac{1}{n} \left( x+y+\frac{1}{n} \right)$ , where  $n$  is the number of subdivisions of the unit of length; and would exceed the error of area at every stage of the approximation.

Now, the subdivision of the unit of length can theoretically be carried as far as we choose; that is, we can make  $\frac{1}{n}$  smaller than any stated number whatever. Then the error of area, which is less than an area expressed by  $\frac{1}{n} \left( x+y+\frac{1}{n} \right)$ , may be made less than any stated area, however small; and thus we have proved that the theorem cannot be in error by any stated amount, however small.

In practical approximation this theory can be turned to account as follows: Suppose a rectangle is roughly 27 ft. by 68 ft. and it is required to determine its area to tenths of a square foot. The expression for the error of area then will give the equation

$$\frac{1}{n} \left( 95 + \frac{1}{n} \right) = \frac{1}{10} ;$$

whence

$$950 + \frac{10}{n} = n ;$$

and from this it is clear that for the required degree of accuracy the sides should be measured to thousandths of a foot.

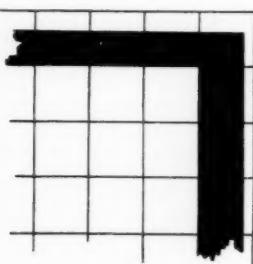


FIG. 3

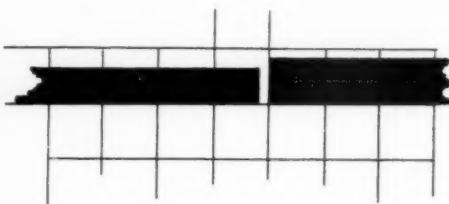


FIG. 4

Again, suppose a surveyor is able to measure to  $\frac{1}{100}$  of a foot; what error is possible in a rectangular lot 300 ft. by 200 ft.? The formula gives

$$\frac{1}{100} (300 + 200 + 0.01)$$

which reduces to an error of 5 sq. ft. out of 60,000—a result which leaves out of account the fraction  $0.0001 = \frac{1}{n^2}$ . Here is the first appearance to the pupil of a quantity of the second order of littleness; whether he goes into college mathematics or not, this idea is of great importance to him.

In the same way for the measurement of a rectangular block we invent an *approximate* solid, and the remainder of the solid to be measured is always less than a layer of uniform thickness, spread over three faces of the approximate solid, and in thickness less

than the finest subdivision (of the unit of length) that has been used for measuring the edges. The *error of volume*, then, is less than

$$\frac{1}{n}(xy+yz+zx)+\frac{1}{n^2}(x+y+z)+\frac{1}{n^3},$$

where  $x$ ,  $y$ , and  $z$  are the length-numbers of the three different edges of the approximate solid, and  $n$  is the number of subdivisions of the unit of length.

For example, suppose a rectangular bin is measured in meters 1.50, 2.00, and 3.20. Its volume then would be 9.600 cu. m. If the measurement were correct to hundredths of a meter, the error could not be so great as

$$0.142+0.0067+0.000001 \text{ cu.m.};$$

and if the measurements had been carried to millimeters the error would be less than

$$0.0142+0.000067+0.00000001 \text{ cu.m.},$$

the relative importance of the three terms of the expression being clearly brought out as the degree of accuracy progresses.

It may be objected that this demonstration is complicated. To be sure it is. The truth which it establishes is one of the most easily believed in the whole of geometry, and one of the hardest to prove to young pupils. The usual demonstration for it is complicated, as are all other propositions about incommensurables, by dependence upon the following "theorem of limits."

If two variable quantities are necessarily represented by the same number, and if each of the variable quantities approaches a limit, the limits are represented by the same number.

There is, however, an appearance of simplicity in the usual demonstration, on account of the separate preliminary consideration of this theorem. The objections to the treatment of the theorem of limits as a preliminary, a lemma, to the measurement theorems, are: first, that the pupil will not know what his lemma means until he gets to the measurement theorems; second, that the theorem of limits does not need any proof: as soon as the pupil can understand what it means he will see that no proof is needed.

The theorem of limits is applied also to the demonstration of another important proposition, for which the device suggested in this article, namely, measurement by a standard unit, will not serve:

A parallel to the base of a triangle divides the two sides proportionally.

Upon this theorem rests the whole theory of similar triangles, and if we had to abandon here our principle of always measuring by a standard unit, reverting for this case only to the arbitrary special devices discarded in the measurement propositions, the surrender would make our plan of reform hardly worth considering. But no such abandonment is necessary. The theorem quoted can be made to depend on the measurement theorems, the line of descent being as follows:

Triangles having constant bases vary as their altitudes.

Triangles having an angle constant vary as the product of the sides including the constant angle.

Equiangular triangles have their sides proportional.

It is needless to say that this suggestion will involve a change in the order of propositions that has become traditional in this country; but the logical order of propositions that happens to be in vogue at our examination stations has no sanctity that a teacher is bound to respect. "The subject, not the book," is expected.

## THE COMPARATIVE STUDY OF WORDS IN FOREIGN LANGUAGES

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The study of a foreign language deals first and last with words. Only through them is there access to the thoughts, so that even the study of literature depends also on the understanding of the words in which literature is dressed. It would be a hopeless task to learn a foreign language, if the foreign words were distinct and separate from each other. The memory could not retain the knowledge of so many unrelated facts. But no such condition exists. Words of the same language are related to each other and to others in other languages. The lines of association cross in all directions, forming a network of connections. Consciousness runs along these lines of connection from one thought to another, using them as bridges from the old to the new ideas. The comparative study of words investigates these interrelationships, with a view to discovering the lines of association between the numberless phenomena of language. It is simply following the instinct of analogy. It is instinctive to note resemblances in objects and to group them together by classes according to their common properties. The same habit prevails, consciously or unconsciously, in the study of foreign words. The faculty of learning a foreign language depends mainly on the ability to see resemblances, and thus to classify readily the new and strange materials. Classified knowledge is easy to remember, and so persons with this ability learn languages easily. Fortunately, everyone possesses this ability in some degree and can develop it by practice. It seems to me self-evident that we should take advantage of this native ability in learning or in teaching foreign languages, and should develop it along the lines pointed out by experience. These lines have been investigated by comparative philologists, and the phenomena which they have observed can be used to good advantage, without any profound knowledge of philology. Philology is too

deep a science for the immature student to understand. Yet some of its principles are comprehensible to him and can be applied by him to his great benefit.

Of prime importance in the study of any Indo-European language are some simple principles with reference to the relationship of the forms of cognate words. The help which even the elementary knowledge of these principles gives, points them out as manifestly one line of relation which the student should be trained to observe. These cognate words bear on their faces the marks of identification. It is only necessary to learn how to recognize the marks, in order to relieve the memory of the burden of remembering the words separately. The principle of cognates is especially applicable to two languages so closely related as English and German. It applies to hundreds of important words, many of which are almost identical in both languages. But in most cases the similarity is not just on the surface and requires the intermediate steps of consonant changes to recognize. But the leading principles of these changes are not many, and facility in applying them is so helpful that it is worth the time and effort required to gain it. More time is required to learn how to apply the principles, for practice is harder than precept. But the habit, once formed, helps to remember a multitude of words, which are recognized as simply variants of familiar English ones. It is applicable to a hundred or to a thousand cases. The amount of time required at first to master the principles grows relatively less, in proportion as the number of cases increases to which it applies, until the time may be practically disregarded.

I have been interested to note by actual count what proportion of German words have English cognates, and the result confirms me in my high regard for this principle. The experiment was with one of Grimm's *Märchen*, chosen for the sake of its familiarity—the well-known tale of "Dornröschen." The nouns and verbs were considered as being the principal elements of the sentence. Of the different nouns, 65 have English cognates in present use, while only 25 have not; among the verbs, 61 have English cognates and 23 have not; so that the proportion of English cognates to non-cognates is almost 3 to 1, and more than two-thirds of the key-words of the selection have cognate forms in English. Of a list of 270 German

nouns of most frequent occurrence, given in Bierwirth's *Grammar*, almost 200 have cognates in common use, confirming the result of the other experiment. The majority of the cognates in "Dornröschen" give also the meaning of the foreign words. Of the nouns, for example, are: *König*, *Bade*, *Tochter*, *Tod*, *Fest*, *Ding*, *Dorn*, *Koch*, etc.; of the verbs, *war*, *sass*, *bringen*, *essen*, *grüssen*, *stechen*, *gebar*, etc. But there are a few whose cognates are not equivalents. As they illustrate an objection to the study of cognates—namely, that the cognate is often misleading, because it does not give the equivalent meaning—the list of them is given; *Zeit*, *Schloss*, *Pjerd*, *Hund*, *Dach*, *Blatt*, *Kopf*, *Lust*, *Stube*, *Fahne* (ten nouns); *wissen*, *bleiben*, *beschenken*, *rächen*, *verlassen*, *bewahren*, *empfinden*, *dringen*, *abraten*, *rupfen* (ten verbs). The fewness of these examples as compared with the whole number of cognates is the first fact that impresses one, less than one-sixth of the whole number lacking a complete equivalent. This is not large enough a proportion to affect the principle of cognates. But even these few are not positively injurious, for they have points of interest to attract the attention. They may be divided into two classes. The first class embraces those whose cognate form is archaic, or special, but yet is clearly suggestive of the correct meaning. Into this class fall the most of these words; namely, *Zeit*, *Schloss*, *Pjerd*, *Hund*, *Dach*, *Blatt*, *Lust* (seven); and *wissen*, *rächen*, *bewahren*, *empfinden*, *dringen*, *rupfen* (six). These words illustrate the changing of the language. Words are not fixed, but shift their meaning, gain and lose currency, broaden or limit their significance, and are displaced in one community, while remaining in good use in another. The words of the first class show a shifting of meaning, but without entirely changing the significance. The shifting one way or another gives just the flavor of interest necessary to fix the word in mind.

*Zeit* is the equivalent of our archaic word, found only in compounds like "Christmastide," "noontide;" *Schloss*, of our "slot," formerly meaning "bolt" or "bar." From its first meaning, implying strength and security, the German has widened its application so as to include "castle," a strong and secure building. *Pjerd* is a "palfrey," an extra horse, a riding animal by the side of a war steed, called *Ross*. *Wissen* is equivalent to our verb "wist" or "wot,"

now limited to conservative legal forms and biblical speech. And thus, interesting points might be given in regard to all of these words.

The second class is composed of those words whose English cognates signify something quite different from the German words. This class is small and consists, in the passage considered, of the following: *Kopf*, *Stube*, *Fahne*, and *bleiben*, *beschenken*, *verlassen*, *abratzen*. These differ only in degree from those of the first class. The shifting of the meaning has been carried farther with them, so that the similarity or suggestiveness of meaning is not striking. It is necessary to delve deeper into the study of language in order to find the bond connecting the German words with their English equivalents. Yet the connection is not remote, after all, with some of them. *Kopf* ("head") and "cup" are similar as regards shape; *Stube* ("warm room") is close to "stove" considered as the source of the warmth; *Fahne* ("banner" or "standard") is similar in appearance to a weather "vane;" *beschenken* is a reminder of the old contrivance used in drawing off liquids from barrels, the idea of giving being developed from the custom of giving to others to drink.

So other words chosen at random, such as *bekommen*, *klein*, *Teich*, *gern*, *gelten*, and *krank*, are more or less closely connected in thought with their English equivalents, and the gap is not too wide to be bridged in thought. They may be taken as texts for little digressions into the history of speech and social customs. These excursions resemble the field trips of the botanist and geologist. Here and there is gathered a specimen illustrative of the processes of language, and enforcing truths of rare interest and value, although gathered by the way. This indirect study is practical for itself and for its effect in brightening up the interest in the routine work. One of Lowell's habits was in accord with what is here suggested. In his biography, Scudder speaks of Lowell's habit of noting down odd words that he met in his reading and of his delight in tracing their derivation. "A word," he said, "whether in Old French, English, or Yankee, was at once a lively interest and an article in a museum. He never tired of pursuing the ancestry or the kin or the progeny of these winged creatures." Any discipline or method suited to develop such a habit as this of Lowell's among students is certainly worthy of recommendation. If it had no other value than of leading to a

better acquaintance with the form and contents of words, it would be worth all it costs as a means of culture.

Another strong bond of association which applies to multitudes of words is offered by the processes of derivation and composition. Words can be classified according to their stems or other component parts. A knowledge of some of the simple principles of derivation and composition lies right on the surface of words. The familiar noun suffixes in German, *-chen*, *-lein*, *-heit*, *-keit*, *-ung*, *-in*, *-er*, *-schaft*, and the adjective suffixes, *-los*, *-haft*, *-ig*, *-lich*, the common separable and inseparable verb prefixes, and the direct derivatives from verbs, occur on every page and thrust themselves into notice. A careful study of them leads to the habit of building up stem-groups. Word after word associates itself with the one stem, until a group of a dozen or two dozen is formed and easily held in mind. In this way the whole stock of words in a given language can be classified, thousands of words falling into a relatively small number of groups. The comparative study of component elements in German words will help to recognize, in the story of "Dornröschen," such words as *Königin*, *Mädchen*, *Schönheit*, *Reichtum*, *Spruch*, *anschauen*, *aufheben*, *freundlich*, *verständig*, *verrostet*, *Schlüssel*, and *Spindel*. In case these derived or compound words are cognate with English words, the associations by the cognate and by the common stem reinforce one another and form a double bond for the word. So much the better. In practice it results that the groups in which the words are classified by the one or the other principle are not wholly separate, but overlap one another. The points of overlapping only strengthen the impression and are so much the more securely held in mind. It may be illustrated by the index of a book. The subject treated many times in different connections has many cross-references, and is brought in that way all the more prominently before the mind. These different associations of words are like cross-references and help to locate the word all the more quickly.

The study of derivation and composition leads to the fundamental processes of language-building. It shows how words are formed and grow, mostly by unconscious processes, according to the spirit of the times. The great languages of ancient and modern times are shown to be essentially akin; to differ in form, but not in

spirit. In Latin the key to many words is contained in the familiar prefixes, *ex*-, *e*-, *ad*-, *con*-, *anti*-, *inter*-, etc., almost all of them being attached to certain verbs. For example: *duco*, *educo*, *adduco*, *conduco*, *introduco*, *deduco*; and *rumpo*, *erumpo*, *corrumpo*, *interrumpo*, etc. The composition of words is not always as apparent as in these cases, but there are degrees of association. Combinations are formed at first loosely and become more closely welded by current usage, until they are frequently no longer recognized as compounds. "Nostril," "sympathy," "biscuit," "rendezvous," "kirmes," and *Kehraus* are examples. The composite appearance is reduced to the minimum in "fret," "aware," "doff" and "don," *Glück*, etc. A notable example of derivatives is the group centering about the word *Specio*. Skeat's *Dictionary* gives thirty-one derivatives in English, all in common use, including such words as "aspect," "prospect," "expect," "expectation," "conspicuous," "perspective," "respect," "respectable," "species," "special," "specimen," etc. From the Greek word *σκέπτομαι*, from the same root, come "skeptic," "scope," "bishop," and "episcopal;" and from the Teutonic root we have "spy."

The study of French and of any of the other Romance tongues is greatly facilitated by reference to the Latin sources. It is not necessary to go into the philological principles deeply in order to see the close relation between the original and the derived languages. Without any knowledge of the special laws of the change from Latin to French, anyone can see the close relationship of *arbre*, *homme*, *fille*, *livre*, *fleur*, *main*, *tête*, *école*, *plume*, *grand*, *bon*, *nouveau*, *écrire*, *prendre*, *venir*, *donner*, *dire*, *parler*, and scores of others, to the Latin originals. The advantage of comparison in such cases is too obvious to need recommendation. Besides aiding the memory, it reflects light on the languages brought into comparison. The habit of comparing the words in the different foreign languages has the added advantage of deepening the impression of all of these on the mind, as they are recalled then more often and each time leave the impression deeper. A better acquaintance with the real significance is also gained at the same time, as one views it in comparison with similar forms.

The French language does not lend itself so aptly to the study of

composition, showing its analytical nature in contrast with the synthetic nature of highly inflected languages like German, Latin, and Greek. Still it falls into small groups of related words, such as: *venir, devenir, revenir, convenir, prévenir, convénient, convenience; écrire, écrivain, écriture, écritea, écritoire; diriger, directeur, direction, directoire*, etc. The study of word-groups in Greek is practically essential, according to the statement of Professor John Williams White, that "the ratio, in classical Greek literature, of the derived and compounded words to the root-words is at least ten to one. . . . It means that one reading through classical Greek literature, from Homer to Aristotle, would find that ten words in eleven on the average are filially related to some other word, and that all were akin."

Thus far only the comparison of the forms of words has been considered. But another very profitable line of comparison is directed to the significance of the words. The meaning of words often yields a very apt bond of association. A glance at the real, etymological meaning will often show the word in a new light. The spark of interest is kindled which photographs the word on the sensitive plate of the mind. Such study is fascinating, and its results are valuable in many ways. Obviously, it leads first to a better understanding of the words. The word "indorse" is plain in the light of its etymology, but is usually only half understood by people who are told to "indorse a note," as is shown by the frequent question whether they are "to indorse it on the back."

The German language lends itself especially well to this analysis of words, for it displays its pictorial quality in the large number of compounds, spontaneously fitted to the new ideas. It depends on its own resources to supply expressions which other languages simply borrow. It is picturesque in its combinations of familiar words to express new ideas. *Fingerhut, Handschuh, Fernsprecher, Bleistift, Eisenbahn, Gasthaus, Gottesacker, Baumwolle, Küchenzettel, Glockenstube*, are instances of this fertility of the German language. In scores of cases it forms a phrase from its own native stock, where the English simply borrows a Latin or French expression. When our word is derived from the Latin or Greek, we appreciate its meaning more thoroughly by comparing it with the German equivalent. Such expressions as *durchsichtig* ("transparent"), *Vorsicht* ("providence"),

*Aussicht* ("prospect"), *entwickeln* ("develop"), *Einfluss* ("influence"), *überflüssig* ("superfluous"), *Mitleid* ("sympathy" or "compassion"), *Handschrift* ("manuscript"), *vorziehen* ("prefer"), help us to understand our words better by calling our attention to their real meaning. They show the real character of words as pictures, merely the outward symbol of the mental view. The comparison of these pictorial symbols shows in many cases that the view-point is different with different nations. One nation seizes on one quality, which it represents in its picture, and another nation seizes on another quality. English "bicycle" and German *Fahrrad*, "overcoat" and *Winterrock*, "knife" (a utensil for nipping) and *Messer* (a meat-knife, probably of stone), "teach" (to show) and *lehren* (to cause to learn), "read" (to interpret the runes) and *lesen* (to gather up the sticks on which are the runes), "plain" (simple), and *schlicht* (derived from *schlecht*), show the different view-points of the two languages. The investigation of the real significance leads to the basis of language, to the genius of the language. For what is the genius of a language but its peculiar spirit, its way of looking at things? Compare the French *cloche* and *pendule* with English "clock"; *garçon* with "boy," "waiter," "bachelor;" *hôtel* with English "hotel;" *faux-col* with "collar;" *épicerie* with "grocery." Old English and the primitive languages were probably more pictorial than modern tongues, to judge by their compounds, such as *middan-geard* ("middle garden," for earth), *heahjæder*, *masse-preost*, etc.

Insight into the real meaning of words conveys many hints of the cultural history of the people. When the Latins used *hostis* ("enemy") to describe one who is, with the Teutonic nations, a *Gast* or "guest," their notion regarding strangers is clearly illustrated. English "lord" (*hlaf-weard*, "loaf-keeper") suggests the bread-winner. German *Buchstabe* is a souvenir of the beginning of writing, when beech sticks had rough characters scratched on them and were used for divination. English "to write" (*ritzen*) commemorates the process of scratching the runes, "read" (*raten*), their enigmatical significance, which only a priest could understand, and German *lesen*, the act of gathering the sticks, preparatory to reading them. English "digit" commemorates the use, in primitive times, of fingers and toes in counting. "Fee" (Latin *pecus*, "cattle") points back to the

time when property consisted of cattle, and "salary," to the payment of money to the Roman soldiers for salt. So the words relating to religion, church, home, school, and social life in general give many glimpses into the social conditions of the early times. The German names for school objects, such as *Schule*, *Schüler*, *Student*, *Tinte*, *Papier*, *schreiben*, *Lektion*, *Universität*, point to the introduction of schools from Italy and to the prevalence of Latin in the Middle Ages. Compare the names of animals. Those which are known to the Germanic tribes have cognate names, such as "bear," "wolf," "fox," among wild animals, and "ox," "cow," "horse," "sheep," "swine," "dog," and "cat," among domesticated ones.

These considerations convince me of the value of the comparative study of words. It is a practical aid to the memory in learning a foreign language. But it touches still higher planes. It is essential in the study of literature; for literature depends on words. No one can perceive the fine distinctions of thought and rise to the understanding of literature, except by fully appreciating the meaning of the separate words. Every aid to such appreciation is of direct benefit to the supposedly higher study of the ideas which the words symbolize. They are the only avenue to the thought preserved in the noble works of literature. They are the medium of that culture which is derived from the contemplation of sublime ideas. We cannot investigate words without penetrating to the mind regulating the language. A broad survey of language and of its phenomena includes the view also of the inner life, the soul-life, of the people. What method leads more directly to the acquisition of the *Sprachgefühl* than this comparative method, which reveals the phenomena peculiar to the genius of the people? Language, in this view, becomes more than an assembly of dead symbols; it is a living organism, shaped by all the influences that converge on the intellectual life of the people; an essential part of man's own being. The study of this organism is as broad as the study of man. It is philology in the sense of Wilhelm von Humboldt, which is broader in its scope than psychology or history, and embraces the consideration of all the circumstances contributing to the development of mankind.

## ECONOMIES IN ALGEBRA

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Ours is an age of economy in production. Especially since the days of Adam Smith the attention of the world has been centered on learning how to do things with the least waste and expense, and most effectively. In our own times we have seen developed and managed with marvelous economy numerous lines of business. The same tendency, as might be expected, is seen also in education. Perhaps the greatest economy in education is secured by the requirement of special training before allowing beginners to teach. Those persons not qualified by natural or acquired ability are thus weeded out by the training school, and those who are qualified are enabled to begin far in advance of the old standard of accomplishment. Another economy consists in applying the idea of specialization whereby the schools are graded and individual teachers have charge of single grades, thus dividing the labor much as it is divided in a modern manufacturing plant.

Now, while it is true that great progress has been made in applying economical methods in educational work, it is doubtless also true that much of current educational effort is enormously wasteful for the teacher and the pupil. The crowding of the pupils, as regards the number of studies and the character of the work required, has come to be a byword, and the results obtained are far from commensurate with the efforts put forth. Such crowding is commonly sadly wasteful both of the nervous energy and of the intellectual power of all concerned in it. Not only is there charge of overcrowding the pupils, but the same charge is made from time to time of overcrowding the teachers also. The poorly paid teacher must put in her full time in the schoolroom, and then must add to this labor long periods spent in correcting papers at home or out of school hours. In more than one school the conscientious teacher works Saturdays and Sundays to keep from being swamped with written work. The

laboring man works eight hours, and then, leaving the shop, can drop his work out of his mind. Not so the teacher. When the schoolroom empties, the teacher must turn her attention to the product ground out by the machine during the day. Mrs. Lew Wallace dealt with this question several years ago in a very striking article entitled "The Slaughter of the Innocents,"<sup>1</sup> in which she speaks of our present school system as out-Heroding Herod. Says Mrs. Wallace:

Of the long-suffering teachers I can hardly trust myself to speak; no nobler army of martyrs ever marched to chambers of torture. . . . After much hesitation this cry goes out—a petition to lighten the load of the overladen. I should not have the courage to send it, had I not been entreated: "Speak for us; write for us; you have nothing at stake. We dare not complain; we should lose our places; there are many waiting for vacancies." Pathetic appeals from the helpless.

What the teacher is required to do, as already stated, is to spend quantities of time correcting the pupils' written work. The pupil is then usually expected to rewrite his paper, making the corrections indicated, and this copy is later checked over again by the teacher and returned. The question arises: Is there no way of giving the pupils the means of correcting their own mistakes? There ought to be, and it is likely that, if the superintendent would seek far enough, he would find it for most studies. The writer knows that there is a way of doing it in algebra, and it is one of the purposes here to make plain how it may be done.

Before going on to discuss the topic just mentioned, however, it will be advantageous to examine a somewhat different, though related, question, viz.: What is the chief object in teaching elementary algebra? Is it to give skill to pupils to enable them to continue their work in more advanced branches of mathematics? Or is it partly for this purpose, but more especially for the intellectual training the subject gives? The answer to this question will evidently have something to do with the character of the teaching of the subject.

If algebra is a mere instrument to be used in the study of trigonometry, analytical geometry, and calculus, then it may, possibly, be permissible to learn its reductions mechanically in the quickest way they can be learned; but if it is in the course for the culture it gives, then it ought to be studied rationally, as an organized body of

<sup>1</sup> Contributed to *Ladies' Home Journal*, February, 1899.

knowledge. An altogether too common conception of good algebra preparation for college mathematics regards it as consisting in skill in performing certain classes of operations and in making certain kinds of reductions. The entrance-examination test, conforming to this conception, seeks to find whether the student is prepared in the matter indicated. Now to solve classes of problems most quickly and with most credit in percentages, the student needs much drill upon them. To prepare for such examination he is given a large number of problems of nearly the same kind, on the principle apparently that he will learn by doing, if not by thinking.<sup>1</sup> In short, the process is education by imitation rather than by cogitation; by the muscular memory rather than by logical association; by repetition rather than by correlation of ideas. Mrs. Wallace tells the story of a mother asking her little boy the question: "Two and two are what?" The boy hesitated. "Surely you know that two and two are four." "Yes, mamma; but I am trying to remember the process." It may be admitted that the process method is often an effective means of producing certain kinds of results, but it certainly cannot be seriously contended that it is a high type of education. If the operations of algebra are merely processes to be learned, the 95 or 98 per cent. of the children whose education proceeds no further than the elementary branches might better be employed in learning the processes of making brick or tanning leather, or the like; for these processes are both instructive and practical.

If, on the other hand, algebra is to be learned for its own sake, then it ought to be taught more as a science, meaning by this that reasons and correctness of results should be made more prominent. That algebra can be taught much more economically as a science than as a body of processes, is the thesis here defended.

Returning now to the topic of expedients for economizing the labor of the pupil and the teacher, it can be said that a very important one consists in making the proof of every problem an integral part of the form of solution. It is likely that a large majority of teachers are unaware that this is feasible. To explain briefly, it can be said that the problems of algebra—using the word "problem" in its

<sup>1</sup> A well-known English algebra much used in this country seems to have been prepared with this thought in mind.

broadest sense—may be classed under one or other of two heads—either transformations in identical equations, or solutions of conditional ones. All problems involving identical equations, which means practically all that part of American algebras except the portion dealing with the solution of conditional equations, can be proved satisfactorily (though not demonstratively) by assigning special numerical values to the letters. It is not intended to convey by this statement the idea that all problems in literal arithmetic should be proved in this way, since a more satisfactory method may be available. Thus both division and factoring problems can most often be proved most easily by simple multiplication of the factors. What is stated, however, is that, when no other method is available, the one described can be used. If any teacher fails to see how identical equations can be verified, and how the proof can be made an integral part of the form of solution, I can recommend a series of elementary textbooks that will prove illuminating. As a rule, the only means the student can have to test his answer to a problem in literal arithmetic consists in assigning values to the letters, and comparing the numerical value of the answer with the numerical value of the given quantity itself. As regards the proof of problems involving the solution of conditional equations, it is well known that they can always be tested for correctness by the process called verification. The verification of literal simple equations gives valuable exercises in all the simpler literal-arithmetic reductions, especially in fractions, and the verifications of quadratic equations gives valuable exercise in radical reductions. It must be admitted that these verifications take time—often much more time than the solution of the problem itself. But such time is well spent, for the operation required gives concreteness, precision, and completeness to a study that is all the time in danger of becoming abstract and confusing.

The plan here outlined, which throws the responsibility for finding out whether the answer is right on the student studying his lesson, has several merits: it continues to give drill in parts of the subject not at the time under consideration; it correlates topics otherwise in danger of isolation; it gives the pupil assurance that he is following the right course in what he is doing, and assurance on the part of the pupil plays a mighty part in successful study; it does away with the

necessity for excessive quantities of written work to be handed in, thus relieving both teacher and pupil.

Professor J. W. A. Young asserts that very little or no home work in mathematics is demanded of the German boys and girls. Not so in pushing America. But Professor Young does not say that our educational product is superior to that of the Germans.

In order to the intelligent study of a subject like algebra pupils must be in full possession of its fundamental principles. Of these, leaving out of account those already mastered in arithmetic, there may be named the laws of precedence of operations, the laws of exponents, and the general axioms of mathematics. The first have been summed up by Schroeder in a single rule;<sup>1</sup> the second are not difficult to master by induction from easy cases; and the third, most important from the reasoning standpoint, must be applied many, many times, as in geometry, to have the force of them properly understood. As regards the use of the axioms, the teacher will find very useful the series of textbooks already referred to. The writer holds no brief for these texts, but he is free to say that they are the only ones which contain both of the features referred to, each of which is of prime importance in the proper teaching of algebra. There can be less hesitancy in referring to these books, since the ideas referred to can be utilized with any text. Drill of the persistent, thorough-going kind placed on these few principles and their application will put the pupil, if the phrase may be allowed, on his algebraical sea-legs. A student grounded in these principles and in the idea of constantly verifying his work (a thing, by the way, required of the most skilled calculators) will prove himself in the long run much superior to one grounded only in mere processes, however thoroughly drilled in these latter he may be.

Up to this time the present discussion has been limited in its scope to the prepared written work, and no reference has been made to the recitation. In the latter also, as might be expected, a great saving can be effected by the wisest use of the time. Two or three different forms of the recitation may be distinguished. There is, first, that form in which the teacher develops the lesson didactically and by questioning the class; there is, next, that form in which the class

<sup>1</sup> See *Encyklopädie der mathematischen Wissenschaften*, Vol. I, p. 10, footnote.

recites, either from written work put on the blackboard during the progress of the recitation, or from tablet work prepared beforehand; and there is, lastly, that form in which a single member is called on to go to the blackboard and write and talk simultaneously, all the class giving attention. In the last form quite as much as in the others, the teacher guides the recitation by appropriate queries directed to the pupil at the board, and also to the other members of the class, as questions come up. Each of the three methods, of course, can be employed at any time desired, and all can be used at one time or another, but the last deserves a much wider use than it now has. A smaller number of problems is solved, perhaps, by this method than by either of the others, but each problem is solved, so to speak, by every member of the class, since each person knows he is likely to be called on at any moment to answer some question or help the one at the blackboard over some difficulty, and so gives attention. The moment a mistake is made by the student at the blackboard the obvious requirement is that every member of the class who sees the mistake shall immediately protest by raising his hand. In this way the teacher can be testing every member of the class during the whole period of the recitation. The attention of the class is held as well as it is possible to hold it, since the members are attacked at three doors—the eye, the ear, and the reasoning mind.

Without doubt, this is one of the most searching forms of recitation that can be devised. The pupil at the board is not only called on to solve his problem without help or with known help, explaining fundamental questions whenever asked to do so, but he must do it under the gaze of all his classmates. The slightest mistake or omission of reason is immediately detected, and his attention is called to it. Written work brought to the class can be corrected, of course, from the solutions on the board. Since writing is much slower than reading or thinking, the slowest in the class can keep up with what is being done, and the brightest can watch the correctness of the work and make suggestions for improvement. It may be remarked that a class can be kept together better by this method of recitation than by the others, since every member is more likely to understand everything that is said and done in the classroom than by either of the others.

It might be thought that only those could be called on to work

problems who had already solved them, but this would be a mistake. A student may be asked to work a problem which he could not get, or one which he had not tried, quite as well as one which he had already done. The only requirement is that the teacher must know how the problem is solved, and he can draw out the solution from the student a step at a time—i. e., on the assumption that the class itself cannot give aid, which is extremely unlikely. Often the work will seem to proceed very slowly in such cases. At other times, after a good start has been made, it will go forward rapidly, and thus time will be saved in the end. Problems that all or nearly all members of the class have solved and verified can be skipped when there is lack of time and only the more difficult ones be solved. It is evident that one excellent feature of this is that all mistakes are corrected as soon as they are made, every member of the class seeing both the mistake and the correction; and another, that pupils can be held absolutely to good forms of statement and good forms of writing solutions. The principal difficulty to be overcome is to get pupils to stand while they write so that the class can see what is written. Usually a position at the board can be selected which will admit of all seeing what is written.

By these methods students are enabled to a very large extent to take care of themselves, so that not nearly so much supervision of their work outside of the classroom will be necessary. It seems almost superfluous to add that such a condition of things is more desirable than one of the paternalistic kind. Education should not be Alpine mountain-climbing with the class roped to the teacher and to each other, for this is too dangerous; it should be traveling together through the pleasant fields of knowledge. The weaker pupils, if they are industrious and their cases are not too hopeless, are likely to grow stronger from day to day on account of the aid received in the classroom, and on account of the assurance gained by constant testing. It is a great pleasure to a teacher to see pupils who come into his class weak even in the elements, gradually grow strong on account of the conditions under which they labor. The individual pupil is put in the foreground and the teacher in the background, and the standard of recitation and attainment aimed at is a high one. The moral traits of reliance on self, care in one's labor, and a habit of doing things right rather than merely doing them, are all strongly inculcated.

## SUGGESTIONS FOR MODIFICATIONS IN THE ORDER AND TIME OF PRESENTING ALGEBRA

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This subject was suggested by the recent radical changes effected in the order of presenting arithmetic. A certain grammar-school arithmetic published in 1895 and the majority of arithmetics published before that time were based upon the false idea that each portion of the subject must be completely mastered before proceeding to the next. All of notation and numeration is given first, and on the eleventh page of this certain arithmetic the pupil is asked to read the number 1,555,676,410.62. Then follows all of addition, subtraction, multiplication, and division.

Since that time a number of arithmetics have appeared arranged on a spiral plan. In these newer publications simple work in the four fundamental operations is given first, then work of slightly increased difficulty, until finally the pupil is led by gradual stages to the more difficult portions of the subject. This plan has everywhere been accepted as being more psychologically correct than the old method of attempted complete mastery of successive topics.

But although this important change for the better has been effected in the order of presenting arithmetic, no change has been made in the order of presenting algebra. The futile attempt is still made to attain a complete mastery of the four fundamental operations as each is taken up and pupils are forced to become familiar with the most difficult cases of factoring before they are permitted to apply the simpler cases in the solution of easy quadratics. For instance, the following example is given in one of the elementary algebras, before any use of the simpler cases of factoring is made in the addition of fractions or in the solution of quadratics: "Factor  $m^2 - n^2 + 2n - 1$ ." If the principle of complete mastery of successive topics is wrong in arithmetic, then it is wrong in algebra.

Before suggesting the changes that might be made in the order of presenting algebra, it would be well to determine the grade of the high or grammar school in which the subject should be introduced. In the great majority of schools algebra is not studied until the first or second years of the high-school course. But there are numerous reasons why its study should be commenced in the seventh or eighth grades, and a number of courses of study, including that of New York city, already require this.

There are not many practical applications of algebra outside of arithmetic, unless the pupil continues his work in college, but many of the examples of percentage, the indirect cases of interest, and proportion can be solved more easily algebraically than by the methods of arithmetic. This is proved by the necessity of examiners to state at the beginning of an arithmetic paper that examples are not to be solved algebraically. The best explanations of square and cube root are afforded by algebra.

The great majority of pupils leave school after completing the work of the eighth grade. Whatever of algebra they are to know must be taught these pupils, then, in the grammar school.

As subjects are now arranged, there is a wide gap between the grammar and the high school. The methods and subject-matter of the two schools are totally different, although the principle that education should be an even, continuous development is well established. If something of algebra is taught in the grammar school, one portion of this gap, at least, will be bridged.

It is also a common complaint, and undoubtedly true, that there is not enough material for difficult thought-work in the course of study for the latter years of the elementary school. This was recognized by the British commission, which recently investigated our schools, as one of the most glaring faults in our educational system. This evil could in part be remedied by the introduction of a grammar-school algebra.

All this argument tends to show that the study of algebra should be begun in the seventh grade of the elementary school. Arithmetic should be practically finished in the seventh grade, and algebra should constitute the principal part of the mathematics of the eighth grade.

Before suggesting the order in which this algebra might be pre-

sented, consider the changes that should be made in the present subject-matter of arithmetic in order that this introduction of algebra into the elementary school may be possible.

Many prominent educators are claiming that arithmetic has not the disciplinary value heretofore attributed to it, and are demanding that it be given a less prominent place in the curriculum. On the other hand, Mr. Goss, late superintendent of Indianapolis, believes that "the American public school especially from the fourth to the close of the eighth year of school life, presents, *aside from mathematics*, no body of science or language which, when mastered, is worth possession as knowledge, or in the attainment of which there is acquired a subtle skill or the elements of a generous culture." But it is doubtless true that much of the latter portion of the arithmetic has been bequeathed to us by the mediæval age and is of little or no value in these modern times.

Professor David Eugene Smith, in the *Teachers College Record* for March, 1903, after considerable argument, concludes that the child's interest in the quantitative side of life should be the highest immediate aim of the teacher of mathematics in the grades, just as his interest in the spiritual side is the highest immediate aim of the teacher of literature; and the nature of the child, together with the needs of society, should constitute the main standard in selecting subject-matter. If this is a true conclusion, then much of that which we now teach in arithmetic will finally go.

Many of the problems of denominate numbers have no practical application in the life of today. Obsolete tables and those peculiar to a single line of business or to a single profession, and examples in which more than three different denominations are involved, have no place in our arithmetic. In everyday life distances are never given in miles, rods, yards, feet, and inches, but in one or two denominations, as 5 yards,  $2\frac{1}{2}$  feet, or  $3\frac{1}{4}$  miles. The housewife or grocery-man never finds it necessary to subtract 3 bushels, 2 pecks, 1 quart, 1 pint from 4 bushels, 1 peck, 5 quarts, 1 pint. Is it not entirely wrong to make pupils for several weeks find the actual time of places when in after-life they will invariably use standard time? Profit and loss is not worthy of a special chapter, for the problems are the ordinary ones of simple percentage. The indirect cases of inter-

est are of little value, and scarcely any time need be given to them. Only the elements of partial payments, annual interest, and compound interest are essential. Many of the examples of exchange, and stocks and bonds, are never met with in the business life of today, and the teacher will find that interest will be aroused, and that the pupil will get a better grasp of the realities of these subjects, if the financial page of the newspaper be used instead of the textbook. Because of the false idea of business life which they involve, many of the problems of commission and brokerage, and of insurance, should be omitted. Few of the newer arithmetics give the cumbersome process of compound proportion, and it might be well if simple proportion were left for the algebraic treatment. Square root and cube root should also be left for algebra.

After this weeding-out process has been completed, arithmetic can be greatly enriched by the introduction of many series of examples which would bring the pupils in touch with different phases of society, and with the phenomenal achievements which are being made in the United States along commercial and industrial lines. Is it not true that almost all the impressions, whether correct or incorrect, that we have of many lines of business and occupations were received from some example or series of examples in our arithmetic? All that many people know of Wall Street are the first impressions they received in the subject of "Stocks and Bonds." Then we can see how important it is that these impressions should be correct, and that pupils should become acquainted with as many phases of life as possible. How much more sympathy we should have with the newsboy if we had solved a series of examples giving the cost and selling price of his papers, and the results showing his daily and weekly sales and profits.

To give another illustration: Running through the northern part of New Jersey, and connecting Newark Bay with Easton on the Delaware River, is an old and picturesque canal. The railroads parallel it now and carry most of the freight that used to go by boat, but it was once an important factor in the transportation of coal from the Pennsylvania mines to New York. The boats are drawn by mules or horses, and the numerous locks and plains so retard their progress that eight days are required for the round trip. A

boat carries about 69 tons of coal, and the boatman receives \$0.47 a ton for transporting. During one round trip he feeds his mules 4 bags of oats at \$1.30 a bag, 200 pounds of feed at \$1.50 a 100, 1 bushel of corn at \$0.75, and long hay every night at \$0.25. For \$2 a week he employs a helper to drive the mules and assist with the steering. What is his average daily wage? Before the railroads were constructed he received \$0.84 a ton and he could carry 75 tons. What percentage of his present daily wage is that of forty years ago? This is only one of numerous series of examples that could be given to make our arithmetic full of interest, and which would bring the pupil into sympathy with many of the different walks of life about him.

But after these additions and subtractions have been made, the subject-matter of arithmetic will be much less than before, and this will give us the opportunity to introduce algebra into the seventh and eighth grades of the grammar school.

In what order shall we present this algebra? A spiral plan, of course, must be followed, but there is great danger of carrying this scheme to an absurd extreme. The successive loops of the spiral may be made to follow each other in such close succession that the pupil is completely bewildered and a sort of mathematical nausea results. For instance, in a certain arithmetic every first, eleventh, twenty-first, thirty-first, forty-first page is devoted to addition; every second, twelfth, twenty-second, thirty-second, forty-second page to subtraction; every third, thirteenth, twenty-third, thirty-third, forty-third page to multiplication; and so on. Such an arrangement cannot fail to do pupils more harm than the old method of complete mastery of successive topics, but we must all agree that the idea of the spiral system is the correct one if applied in a sensible manner. When pupils reach the seventh grade their minds are more mature than when the beginnings of arithmetic were made, and they are ready to think more deeply and to grasp more difficult ideas, so that there is even greater danger here than in arithmetic of making a too frequent turn of the spiral.

Begin the algebra during the first half of the seventh grade, and teach it in connection with arithmetic. The mathematics of the eighth grade might be entirely algebra, but in the applied problems

of both these grades pupils should be given the choice of solving by the algebraic or arithmetic methods.

The algebra of the seventh grade might consist of simple work in the four fundamental operations, the easier cases of factoring, linear and quadratic equations. This will be the first turn of the spiral. In the eighth grade review the work of the seventh grade, but go more deeply into the theory of the subject, and increase the difficulty of the problems. In addition to this, give something of the theory of exponents and coefficients, the binomial theory with positive, integral exponents, and square root. In the first year of the high school teach thoroughly, from the four fundamental operations to the theory of equations, some standard text. This is the third and last turn of our spiral, and the pupil should now be prepared to delve deeply into the subject and to get a firm grasp of its underlying principles, so that he will be able to make it his useful servant in all subsequent work in physics, chemistry, astronomy, and the higher mathematics.

## ORAL READING AS AN AID IN THE INTERPRETATION OF LITERATURE IN THE HIGH SCHOOL

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My theme contemplates the discussion of but a part, though an essential part, of the function of the teacher of literature in secondary schools. There are at least three objects of paramount importance which the teacher of literature should constantly bear in mind, in his endeavor to obtain the best results from imparting to his pupils the full sense and significance of any given piece of literature, in prose or verse. The first requisite to the adequate understanding of any written composition is, in a large degree, mechanical. The learner must be taught something of its history, its authorship, its general purpose, and its relative importance in letters. Allied to this knowledge, and much more difficult, is that study which may be considered the staple and vital part of literary training, namely, the complete intellectual mastery of the book or selection under examination. This implies an exact knowledge of its form, metrical or prose; of its diction, its profundities of thought, and its refinements of artistic expression; and, above all, of its spirit, its motive, and the distinctive individual trait which constitutes its style and originality. Lastly must be considered that profound cultural quality of every great work of literary art, especially every great poem, which cannot be taught by ordinary methods of instruction, however clear and forcible, but which depends upon the living voice for its interpretation, especially with young and immature minds. I quite agree, on this last point, with Professor Hiram Corson, who, in his lively little protest against merely mechanical teaching, first published in 1894, *The Aims of Literary Culture*, says:

Literary knowledge and literary culture are two quite distinct things—so distinct that a student may possess a large fund of the one, and be almost destitute of the other. He may be able to answer any question asked him on English literary biography, or history, or the cheap philosophy of English literature

presented in his textbook, or on ten thousand other things merely *incident* to the literature, without ever having truly assimilated any single poem or impassioned prose composition; for assimilation, in such case, is largely a spiritual process.

Every teacher who loves literature for its own sake, and who derives from it the thrill awakened by what is called true appreciation, must agree with Mr. Corson, where he says:

The indefinite spiritual element which every true poet must have, and which constitutes its real life, as a poem, we can only know when our own spirits respond to it, and then we may be said to know it more vitally than we know the definite intellectual element of it; for it is a matter of inward consciousness, and there is nothing more vital and positive than that.

Again, we will all assent, I think, to the general statement that the best response to the essential life of a poem is secured "by the fullest interpretive vocal rendering of it;" and that "the vocal rendering must exhibit not only the definite intellectual articulation or framework of a poem, through emphasis, grouping, etc., but must, through intonation, varied quality of voice, and other means, exhibit that which is indefinite to the intellect."

It will be observed that Mr. Corson is mainly interested in the art of teaching excellent poetry, to which end he deems vocal rendering absolutely necessary; but there is a more obvious and purely intellectual necessity which the teacher in ordinary schools will find for the use of vocal speech, in making intelligible the printed sentence. Not only must

"voice and verse  
Wed their divine sounds, and mixed glory employ  
Dead things with inbreath'd sensible to pierce."

but plain prose often needs the vocal organs to interpret the idea hidden in the inky symbol.

It is a commonplace that the first object of the teacher is to make the learner understand. The word exists for the sake of the idea; but the word does not always convey the idea, even to the somewhat trained mind of the high-school student; and sometimes the misunderstanding of a sentence arises from a failure to get the right meaning of a particular word. For instance, many a pupil, on first reading *L'Allegro*, has fallen into the natural error of associating the idea of sentimental talk, and not of mere sheep-counting, with the lines:

"Every shepherd tells his tale  
Under the hawthorn in the dale."

A writer in *The Dial* confesses that the only line in Gray's "Elegy" which, in school, made an impression on him, was the line, "The dark, unfathomed caves of ocean bear," and that he was deeply interested and puzzled regarding the natural history of that same "ocean bear." Even our great American poet and critic, Lowell, when asked the meaning of Browning's poem, "Sordello," placed his hand over his heart and answered: "I don't know."

The most felicitous oral reading might not much assist where there is a deficiency of knowledge of the particular passage read.

But, in many cases, the mere utterance, the right pause, the true phrasing, the quality of voice, make clear the meaning of a sentence that the eye alone might not rightly interpret. A few examples may be cited:

"Then shall man's pride and dulness comprehend  
His actions', passions', being's use and end."—POPE.

"And who but wishes to invert the laws  
Of order, sins against th' eternal cause."—POPE.

"If Fortune be a woman, she's a good wench for this gear."—*Merchant of Venice*.

"If the devil be within and that temptation without, I know he choose it."—*Merchant of Venice*.

"Bassanio, Lord Love, if thy will it be!"—*Merchant of Venice*.

"for the poor wren,  
The most diminutive of birds, will fight,  
Her young ones in her nest, against the owl."—*Macbeth*.

*Iago*. I did not think he had been acquainted with her.

*Oth*. O yes, and went between us very oft.

*Iago*. Indeed?

*Oth*. Indeed? Ay, indeed. Discern'st thou aught in that? Is he not honest?

*Iago*. Honest, my Lord?

*Oth*. Honest. Ay, honest.

*Iago*. My Lord, for aught I know.

—*Othello*.

Numerous instances might be gathered from standard literature, of sentences which are relieved of their apparent obscurity by the proper vocal rendering. But it is not in the correction of such errors that the fine art of the elocutionist is put to the severest test. The

really good reader, who thoroughly comprehends the inmost significance of the language he aims to interpret for another, may not only reproduce the conception of an author, but may invest it with a consummate charm that would delight the author as with a sense of something beyond words as mere signs of ideas. He adds "the gleam," as it were, "the light that never was on sea or land." He may startle the minds of his pupils to an unwonted degree of receptivity by the mere suggestiveness of modulation and tone and cadence. He seems to give perfect utterance to the elusive and unattainable reality which even the greatest poet strives vainly to express, because the merely visible instrument, though it conventionally represents his thoughts and feeling, is inadequate. What infinite pathos and beauty a Jefferson imparts to the relatively commonplace speeches in *Rip Van Winkle!* Doubtless Shakespeare would have caught from Booth's inimitable rendering of *Hamlet* some far-reaching significations which even the "rapture of creation" had not revealed to himself.

Few orators, few masters of dramatic representation, few teachers even of the profoundest discernment and the greatest vocal skill, can, by their art, pluck the deep soul out of the mystery of an immortal poet's song. Much less may the ordinary instructor, though an accomplished scholar, hope to perform the miracle of perfect oral interpretation. The most that can be expected of the average conscientious teacher is that by a sincere and luminous reading he may awaken in the hearer a true emotion of conscious delight and a strong desire to penetrate more deeply into the hidden melody which breathes the elusive meaning which the writer labors to make audible to the soul. After the poem or other impassioned work of literary art has been intellectually studied, analyzed, synthesized, grasped as a whole and in its complex details, then may it be read aloud with all the power and enthusiasm that may make its dry bones live, transforming mere anatomy into physiologic and psychic actuality. The class will respond to such reading, and go forth from the recitation elated and inspired with a new reverence for the studies which hitherto they may have regarded as mere task-work, or at best only as material for intellectual discipline or as the means of passing an examination.

But should the pupil himself be required to read aloud for the purpose of elucidating the thought and feeling of the author studied? Yes, such practice should be attempted even in the lower classes, and persevered in, under intelligent guidance, until he finds himself enabled by this practice to verify, by the just management of the instruments of speech, such conceptions as, by silent study or by listening to others, he has acquired. He will learn to do by doing; he will translate type into tongue; his oral reading will react upon his faculty of perception; he will discover that without a clear understanding of the text no intelligible elocution will be possible.

However, the teacher must not expect too much of the beginner, nor depend upon a presumed natural talent, nor exact high art from the tyro. He should be patient with the callow youth and with the crude monotony of the growing maiden. Joubert, that wisest of French teachers, has written that "children have more need of models than of critics;" and this is especially true as regards the acquisition of the elements of any art.

## EDITORIAL NOTES

GEORGE HERBERT LOCKE

It was in an early number of the *Educational Review* that Professor Royce, of Harvard University, urged the appointment of a consulting psychologist *THE OPPORTUNITIES FOR SCIENTIFIC INVESTIGATION INTO EDUCATIONAL CONDITIONS* in connection with a system of schools, whose duties it would be thoroughly to study pedagogical methods and mental traits, and from a critical study of individual children in the schools to suggest to the teachers better methods of procedure. At that time this was looked upon as a mere dream indulged in by a psychologist, and even today there are men in charge of systems of education who covertly sneer at anything so theoretical. It is interesting, however, to record that Chicago did adopt this suggestion some years ago, and at the present time there is such a man, whose labors have been exceedingly fruitful, and the results of whose investigation scientifically performed with a sympathy for pedagogical methods, have done much to relieve child-study from the odium that attached itself to that part of educational work on account of the emotionalism of the movement. Child-study needed to be saved from its friends. A recent book on administration and supervision of schools<sup>1</sup> advocates the appointment of just such a man in connection with every large city school system, and doubtless there was in the mind of the author the great success that has been achieved in Chicago. This is investigation from within the school system, and should be provided for that the children may be protected from the mechanical teaching that takes no thought of the peculiarities of the individual, mental, moral, or physical; and, on the other hand, that the teachers may be made aware of these peculiarities, their significance, and ways and means of detecting them.

But there is another kind of investigation that is as important, but which in this country has been neglected, or has been undertaken only in a very general way in those departments of education in connection with universities that offer practical courses in the organization and administration of schools and school systems. This is the investigation of school systems from without, a thorough study of the system of schools in a city, its organization and administration, its curriculum, indeed, the methods by which the city undertakes to afford opportunities for education to its girls and boys. Those who have been working in departments of education where such investigations have been undertaken have long felt the inadequacy of the means at their disposal to make thoroughly intelligent the exact educational situation in a given city, and to explain on any

<sup>1</sup> *Our Schools: Their Administration and Supervision.* W. E. Chancellor, Boston: D. C. Heath & Co.

educational, not to say reasonable, ground the many changes that have taken place since the inauguration of the system. In organization and administration of city school systems in this country we have been experimenting in a wonderfully unscientific manner, and generally without much thought of the educational consequences. The result is that we have a lot of isolated, sporadic, fugitive experiments without any scientific procedure or any scientific record of the results by which we might be able to make progress instead of repeating in other places, and without any regard to the different environment, the experiment that for a time seemed successful and was therefore attractive. Illustrations of these kaleidoscopic changes might easily be given and one's thoughts turn to the far-famed and much-lauded Cleveland plan, which had a brief and glorious existence and afforded much opportunity for oratorical display at our national educational conventions. The Toledo plan was attractive and led us to hope that it would survive, even in Ohio; but the hope is diminishing. The plan in St. Louis is now talked of as being successful—for St. Louis—and many of us are looking with hope upon that seemingly excellent plan of organization of the school board in Indianapolis. The story of the Boston school board has been running as a serial, with the situation so acute in some chapters that we wondered what the characters would likely do to one another in the next chapter. It seems that now the Commonwealth has stepped in, and, like the *deus ex machina*, this may be the final solution to a perplexing situation that will not solve itself. We are promised that "to be concluded" will appear in this instalment of the story.

It must have been when thinking over this great diversity in organization and administration, and then looking for comfort to the curriculum of our school systems, and finding that it was in the same non-progressive state, that Professor Hanus wrote his paper on "Obstacles to Educational Progress," and urged scientific investigation and experiment. At the meeting of the Department of Superintendence at which this paper was read, a committee was appointed which drew up a comprehensive plan for investigation into educational conditions, too comprehensive for some of the persons who had control of the purse-strings of the National Educational Association, and therefore progress consists still in educational discussions in which the same persons thresh over the same old straw and emerge covered with perspiration and dust and newspaper notices.

In the meantime, progress is being made elsewhere. The readers of this journal are acquainted with the *Special Reports on Educational Subjects*, a series of investigations into educational conditions, undertaken under the direction of Mr. Michael E. Sadler, then at the head of the department of special educational inquiry in England. These were exceedingly valuable, and no library of educational works is complete without them. By what seemed at the time an unfortunate turn in political affairs in England, Mr. Sadler felt he could not retain his position, and became a free lance in education. Subsequent events have proved that it was one of the best unwitting acts that a government could have performed; for Mr. Sadler was free to help the cause of education in a much more direct,

untrammeled manner than he would have been in a government office. The Act of 1902 provided for what might be called the establishment, or perhaps the organization, of secondary education in England, and the cities found a perplexing problem on their hands. The more progressive ones recognized that to continue along the old lines merely would not mean progress, and therefore looked about for suggestions. Mr. Sadler's reports had marked him out as a man of insight, foresight, and educational sanity, and during the past two years his services as an expert investigator have been in demand. The results of his labors are now appearing in a series of reports, of which the *Report on Secondary Education in Liverpool* is the largest and most interesting, as the situation in that great commercial city presents so many and varied features. The method of procedure is very suggestive for investigation in this country. The Education Committee invited him to report to them upon the present condition of secondary education in the city, and upon the best means of extending and improving it. It was impossible, as Mr. Sadler says, to do this without making it but one part of a larger whole, and therefore he has made a general survey of the educational system of the city, has considered it as a whole, instead of concentrating attention upon only one part; has examined the links which connect its various parts; has considered the kind of service which, if adequately maintained, each group of schools might fairly be expected to render to the civic life and to the commercial interests of the city; and has measured the efficiency of the educational equipment of Liverpool, more particularly as regards secondary education, with that of some other great commercial cities in other lands.

The whole report is interesting even to the reader in this country, but specially valuable is the chapter on "The Secondary Education of Boys in a Great Commercial City." The situation is graphically portrayed by Mr. Sadler in one of the early paragraphs.

The educational problem in Liverpool is the education of commercial England in epitome. Here, within the limits of a single city, are all the difficulties and all the opportunities which present themselves in the great problem of national education as it bears upon the welfare and efficiency of a commercial state. The intermixture of nationalities in its population, their diverse traditions, temperaments, and ideals, make the questions under review extraordinarily interesting, but also extraordinarily complex. All that is most significant in the commercial greatness of Britain is represented here. Here is the great city which, like England itself, is the link between the Old World and the New, sensitive to the traditions of the one and to the aspirations of the other. Here are the gradations of class distinction and the contrast between wealth and poverty, which affect the whole structure of our English society, and therefore its educational organization. Here one feels the power of individual enterprise and the stern necessity for its continuance, but also the growing power of the State and the need for subordinating individual interests and selfishness to its paramount claims . . . In Liverpool again the student finds himself in the presence of that animating power of civic idealism and of pride in the city's welfare which is playing so great a part in the remodeling of English life and of English education.

Mr. Sadler examines carefully the commercial tendencies of today, and

decides that the commercial success of a modern nation is to a great extent the outcome of national policy and organization; and yet he recognizes that, on the other hand, no nation can be supple and vigorous which does not develop among its citizens a high degree of individual enterprise and the power of acting intelligently when alone. The phrase "supple and vigorous" as applied to a nation is very apt and should survive. We need more of that kind of education even in our own country, which because of its youth has still these qualities but for the retention of which better educational methods must be devised. It is true, as Mr. Sadler says, that over-organization cripples a people, while unrestrained individualism dissipates its effective power. Elementary education in England has suffered from lack of variety, while in secondary education there has been too great a disregard of the need for public assistance and the value of public control. At first reading we are surprised to notice the assertion that it would be a great misfortune for a commercial city to make commercial knowledge the dominant aim of its secondary education; and yet it is a very reasonable position, for, as Mr. Sadler says, "what a school can do is not to create business ability or show short cuts to commercial success, but quicken the imagination, train the faculties of the mind, and lay the foundations of manly character."

We agree with the statement that modern business develops an ever-increasing need for men possessing the power of organization, and that this power of organization, to be fully effective under modern conditions, postulates clearness of thought, persistent application, accuracy in details, a wide range of knowledge, the habit of applying knowledge and of combining different portions of knowledge in new forms, and sensitiveness to the bearing of new developments of knowledge on customary methods and on traditional points of view. This seems an ambitious program, but it is what the people have a right to expect from the schools; if expected, however, the schools must be adequately supported. Mr. Sadler quotes the saying of Wilhelm von Humboldt, "Whatever we wish to see introduced into the life of a nation must first be introduced into its schools," and then makes the plea that the English schools should, therefore, essay a double task, and endeavor to impart both stimulus and discipline, the love of knowledge and the care for conduct, power of imagination and power of criticism, love of adventure and readiness to endure routine. The tendency toward scholarship-winning as an end in education is inveighed against as being toward trivial and unreal things, a result of which is want of the grip and of the reality and of the plain speaking on intellectual matters which are necessary to develop sturdy thinking power among the boys who should be the future leaders in all departments of national life. The fundamental aim of secondary education is the human aim—that which gives to each of the scholars the chance of that development most congenial to his native powers. He will be helped toward a wide outlook and to sincerity of judgment, to sympathy, but also to self-control; alertness for work and civic loyalty are results which may be hoped for from such an education.

So in a report of over two hundred pages Mr. Sadler examines critically the

resources of the city, its needs, its present institutions and their possibilities for development, and, as we have shown by these extracts, lays down the principles upon which right progress can be made. England is fortunate in having available for such an important work, such a clear-headed, independent, and thoroughly trained investigator. Through such reports as these upon Liverpool, Sheffield, Huddersfield, and Birkenhead, these cities have an opportunity of learning the exact educational conditions, and of having plans submitted by which the practical and pressing needs of the community can be met with the utmost economy consistent with real educational efficiency. We believe that if such an investigation could be made into the system of schools in some of our cities, on even a larger scale because covering the whole system, it might result in more real progress than we are now attaining.

The work of the University of London is but little known in this country, accustomed as too many of our educators are to think of Oxford and Cambridge

*THE INSPECTION OF  
SCHOOLS BY THE  
UNIVERSITY OF  
LONDON AND THE  
LEAVING  
CERTIFICATE*

as containing almost all the effort toward higher education in England. There are three great departments of the work of this university, at the head of which is a registrar. The first has charge of the external examinations leading up to degrees. Up to about four years ago this was the work for which the university was known. The second deals with the internal work—the teaching side of the university—as carried on in the various colleges associated with the university. This has greatly increased during the past few years, owing to private munificence in endowing the college work. Indeed, the interest of private individuals and of various guilds and societies in encouraging college work in the cities of England is a most remarkable and hopeful tendency. The third includes the university extension work transferred to the university by the London Society for the Extension of University Teaching, and the inspection and examination of schools. This department has the two divisions, one of which has been in good working order for some time under the auspices of the Society, but the other had to be created and is the pioneer of the movement for closer relationship of universities and secondary schools.

The inspection is carried on by officers of the university specially detailed for this purpose. They correspond to the high school visitors in connection with the accrediting system in vogue in the middle and western states of our country. There is, however, a decided difference in the thoroughness with which these English inspectors do their work from that of our visitors, if one may judge from the instructions issued and the information insisted upon. It looks to us like control, while in this country "friendly relations" seems to be the only attainable object. The inspector must inquire into the aims of the school as related to the circumstances under which it is placed, and the general conception of education which it seeks to realize; must consider the curriculum and arrangements as adapted to its aims, the distribution of subjects in the time-table, the grading and size of classes, the adequacy of the number, qualifications, and remuneration

of the teaching staff, and the organization and equipment of the school for studies, including libraries, physical training, recreation, and discipline. The inspector must also hear lessons given by the staff, and may at his discretion take any of the classes so that he may the better judge of the discipline, tone, alertness of mind, and intelligence shown by the class. If the school authorities so desire, the inspector is allowed to select from questions submitted by the teachers, and presumably covering work previously done during the sessions, certain questions which are then submitted to the pupils. The answers, after comment by the teachers, are corrected by the inspector. The report handed in by the inspector is in two divisions, the first being of a general character setting out the conclusions and recommendations; and, second, a confidential report containing detailed criticisms and references to individual departments and classes of the school work, and designed especially to be of service to the staff of the school.

The student who has successfully passed through a course of study in a school approved by the inspector is given a leaving certificate which satisfies in all respects the requirements of matriculation, so that any candidate obtaining this becomes thereby at once a matriculated student of the university, provided he has reached the minimum age fixed for matriculation. The general scope of the course of study to be pursued is indicated by the subjects in which examinations are held in connection with the final year of the school work. These are English; elementary mathematics; either Latin or one of a specified number of science subjects; any two other optional subjects, of which, if Latin be not taken, one must be a language. There are provisions also for examinations for advanced standing, if the student prefers to remain at school after he has passed this examination. At first it looks as if the old examination system was retained in almost its pristine splendor, as the university authorities set the papers. But there is another side to the situation. The leaving certificate records the period during which the candidate has been a pupil at the inspected school or schools, the subjects of the curriculum through which he has passed, and there is further afforded in the certificate an opportunity for a statement of any distinction obtained by the pupil in any form of manual, artistic, or technical skill, or any general or special capacity displayed which is not tested by the examination. These qualifications are taken into consideration in connection with the examination.

An interesting and significant result of the success of this experiment of the past two years is that the universities of London and Cambridge have come to an understanding whereby the London Matriculation Examination, under certain conditions, is accepted by Cambridge in lieu of the Previous Examination, while the Previous Examination of Cambridge and the Senior Local Examination are accepted under certain conditions in lieu of the Matriculation Examination of the University of London. Negotiations are in progress for a similar arrangement with Oxford which, when completed, will make it possible for a school on one examination (after inspection) to send its pupils after leaving

school to any of the three universities. What has been done in the case of a single school the university is prepared to do for the whole of the schools under the control of a local authority.

This seems a great step in advance for England, and when the examination for the leaving certificate is set by a joint board composed of representatives from the teaching staff of the co-operating universities of Oxford, Cambridge, and London, and also from the staff of the secondary schools, we may look for the excellent results now obtained in the plan of our Central Examination Board, but supplemented by the valuable data arising from the thorough system of inspection by the universities concerned. Thus it seems that to England we may look for a combination of the accrediting and the examination systems, the results of which ought to be of great benefit to both schools and colleges.

## CORRESPONDENCE

### THE DECLINE OF GREEK

*To the Editor of the School Review:*

MY DEAR SIR: There is no doubt that the study of Greek is on the wane. Matriculation for college is complete without it, and its consequent loss in secondary schools is coincident with its introduction to the college course as a freshman elective. The causes assigned for this state of affairs are as various as the sources whence they emanate. The advance in science, aided by the commercial appeal in the practical application of results; the national disinclination to leisure and culture, and our impatience with the subjects not immediately useful; the eager pursuit of short and easy roads to wisdom—these and more appear as causes from time to time. But such explanations are only partially true, because they are the external conditions to which the study has been exposed.

Years ago the study of the ancient languages was solemnly begun (and this is still true in many of the schools with a too venerable tradition) with the memorizing of a mass of abstract rules under which fell with mechanic precision shattered sentences from model writers who straightway with honest human perversity delighted to plead for the exception. That memorizing of undigested rules has fortunately passed away in the more enlightened centers of learning; but it has not yet come to pass within the memory of man that youth is trained after seven years of Greek to take up and read with ease and pleasant mastery any Greek writer whatsoever, however simple the syntax and vocabulary. Few men enter college with ability to read well at sight; and yet, if he fails to read well on entrance, a man may confidently despair of marked progress in that direction thereafter.

Here, then, lies the trouble: the manner of presentation. The greatest enemies to the enthusiastic study of Greek are the teachers themselves. They must not put the blame on the shoulders of science; they must own to a lack of humanistic interest. Men like J. H. Wright, B. I. Wheeler, Basil Gildersleeve, and Paul Shorey merely prove that technique need not overwhelm interpretation, and that the greatest scholarly attainments need not stand in the way of that finer sense of human values which inspires a student with an enthusiasm for the content of his subject lasting the rest of his days. The great majority of teachers, however, have qualified for their positions through some technical excellence in philology or archæology upon which the doctorate affixes the seal of learned approval; they have qualified, not through wide reading at first hand, nor through the quality of making their field intellectually indispensable because of their personality. Thus it happens that the literary and æsthetic are subordinated to the structural

and syntactical, until we have the spectacle of a course on the *Republic* turned into a carnival of moods and tenses.

Nevertheless, in spite of the decline caused in and out of the ranks of professed advocates, Greek is still read with pleasure by those who would not willingly let a beautiful possession pass forever out of their lives, once they have known its wayward glances, its rapturous music, its imperishable subtlety of insight. Its literature is luxury itself for diversity and extent; its mythology has charmed and vivified every poet of distinction whom it has touched; its religion has written itself through modern theology. And, with all the glamour of achievement, the instrument itself is as fresh as the day it sang on the lips of the rhapsode. The immense difficulty of Greek is often urged against its pursuit. No language in the world is more tolerant of intimacy upon the slight acquaintance of a year. The Retreat of the Ten Thousand never offered such difficulties as the Gallic campaigns, nor is Homer ever so perplexing (although in dialect) as the perfectly polished Virgil. If in our schools we had reversed the order of Greek and Latin, the latter would prove the more difficult and, as now, the less worthy of continued study for purposes of culture.

Now, passing by the question of comparative difficulty as of little moment, what mental faculties are best trained in reading Greek? They are three in number: memory, imagination, and judgment. With two of these every youngster is born, while the third is only slowly evolved. Remembering that our aim in the study of language should be the learning to read, read, read, we must not divert our energies overmuch to structure of words or modes of thought-process. Still we must memorize the most important paradigms of nouns and verbs, and, above all, master about eight hundred words for our working vocabulary. If carried on with constant attention to association in groups or roots, this will require and strengthen memory, our first and fundamental faculty. As our experience is young, our expeditions into the unknown with this equipment demand an adventuring, darting, resourceful, inconsequential disposition. This faculty abounds so liberally that parents, mistaking its function, foolishly repress it on moral grounds. I refer to the imagination. Closely allied, but totally different in office, comes the third and last evolved faculty, the judgment—the cautious, deliberative, selective power which arbitrates when the imagination supplies several candidates for the proper meaning. Thus the imagination is kept from waywardness and the judgment from narrowness.

Somebody may ask, however, why should we claim that Greek alone educates these faculties, why the modern languages are not entitled to the same high place. The modern languages, on account of their practical advantages, will always be widely studied, and it must be granted that in the practice of sight-reading they doubtless train the same faculties in much the same way; but they are defective because they are too close to our own modes of thought, expression, and form. The alien form of the Greek letters themselves makes the learner elastic in mastering them. The compounding of words, too, gives it a richness of vocabulary

approached by no language save German, which it ever exceeds in lightness. Again, the variety in inflections, endowing the noun-forms with myriads of colors and the verb-forms with a picturesue restlessness as of the sea they loved so well, is matched in no other language. In brief, the subtlety, the swift changes, the strange harmonies, are as distinctly endless in suggestiveness as Hellenic sculpture. And as form of body has never been more beautifully expressed, so no people have ever written or talked with more regard to artistic finish or with lovelier grace of motion.

Finally, no great master in the art of written expression but has been markedly better for the direct influence of Greek; while no later man of distinction or genius without it but has suffered, perhaps, from lack of that calm of self-control, that ease of climax, that profound concern for absolute perfectness, with which the Greek always impresses the true student and makes him conscious, in a profounder sense than ever, how justly the Greeks regarded those ignorant of that language as barbarians. If the study of Greek could reveal to a mind no writers except Homer and Sophokles, he would have in these (if he has a soul) the sources of never-failing refreshment and wonder. This, however, Greek can never mean until the student resolves to work out his salvation apart from the faulty modern methods of teaching, or until reading is bred into him from the earliest possible moment. From disconnected, manufactured sentences you soon acquire a hesitant habit of mind which renders you panic-stricken before a long, lazy stretch of narrative. Let classical masters insist on making the ability to read at sight the object of prime importance in Greek and Latin, and we shall have within twenty years a body of enthusiastic humanists in America capable of holding their own in a more efficient way with the great traditions of Germany, France, and England.

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## BOOK REVIEWS.

*Adolescence: Its Psychology and its Relations to Physiology, Anthropology, Sociology, Sex, Crime, Religion, and Education.* 2 vols. By G. STANLEY HALL. New York: D. Appleton & Co., 1904.

In two bulky volumes President Hall has produced an *omnium gatherum* of data and doctrines regarding adolescence which is encyclopedic in its scope and variety. A vast literature has been ransacked to afford facts bearing on all phases of adolescent experience and their bodily and social correlates. The work is a mine of information, a résumé of investigations, relating to such topics as "Growth in Height and Weight;" "Adolescence in Literature, Biography, and History;" "Adolescent Psychology of Conversion;" "Growth of Motor Power and Function;" "Diseases of Body and Mind in Adolescence;" "Adolescent Feeling toward Nature;" "Psychology and Pedagogy, or Adolescent Races and their Treatment." To review within the usual limitations of space a book of such varied contents as this seems to the present writer a sheer impossibility. I will try to confine myself to what seems to be the general standpoint and method of the book.

In the preface Dr. Hall announces that this book is based on the author's *Psychology*, now in preparation, which should logically have been published first. The standpoint of the latter is roughly and provisionally indicated in chapter x. This chapter deals with the "Evolution of the Feelings and Instincts Characteristic of Normal Adolescence." "Paleopsychism" is a word with which the author conjures. The book is permeated with what, for want of a better expression, might be called geological psychology. The individual child and youth is conceived of as mounting upward through the different strata of age-long race-evolution; he recapitulates the now fixed stages of a prehistoric past. This doctrine leads Mr. Hall to regard the non-volitional movements of earliest infancy and of later childhood as one of the richest of all the paleopsychic fields. He takes issue with the well-known Groos theory, which interprets such movements as anticipations of future useful activities. According to Mr. Hall, such movements are to be explained rather as "ancient modes of locomotion, prehension, balancing, defense, attack, sensuality, . . . motor odds, ends, and titbits," often suggestive of an "almost saurian age, like the swimming movements of young infants, old modes of climbing, hitting, fighting, hunting" (Vol. I, p. 160). Likewise Mr. Hall conceives the child from nine to twelve as representing "an old and relatively perfected stage of race-maturity, still in some sense and degree feasible in warm climates, which, as we have previously urged, stands for a long-continued one, a terminal stage of human development at some post-simian point."

Child-development, then, is a sort of progressive stratification. Each stratum, as laid down in the life of the individual, represents some deposit of early race history. The microcosm of the ontogenetic series duplicates the macrocosm of the phylogenetic series. The child is faced back to the past. A stratum once formed through this retrospection imitation, so to speak, a new influx of energy accrues which breaks through the mold and demands restratification. Thus "at dawning adolescence this

old unity and harmony with nature is broken up." The new elements introduced from the environment are more complex than ever before, the new energy more fiery, the possibilities of control more unstable. It would seem, if I understand the author aright, that the nearer the child-youth approaches the upper levels of stratification—the surface and soil of the earth itself—the more volcanic the strata become, thus reversing the usual course of nature.

According to Dr. Hall, the chief characteristics of adolescence are its intensity of energy, its emotional instability, its passionate fondness for excitement. He enumerates, with a wealth of detail and illustration, twelve types of this instability and fluctuation, of this extreme tension of opposites; e. g., overexertion versus languor, selfishness versus self-abnegation, extremes of sociability and solitude, sensitiveness and indifference, eagerness and complacency, wisdom and folly, knowing and doing, introspection and objectivity, conservatism and radicalism, virtue and vice. So crowded are these pages with instances of violent extremes in all kinds of activity—mental, moral, and physical—that the reader wonders if so much instability can be locked up in the experiences of the healthy boys and girls he has known, without bursting the barriers far more often than it actually does. Are these the "Feelings and Instincts Characteristic of *Normal Adolescence*"? It is a question whether President Hall's method is not to force the note of the pathological and morbid whenever the occasion permits. That he has described a pair of extremes, a virtue and a vice, too violent to fit into the experience of some morbid youth may not be doubted. But that he has described the typical and normal is open to serious doubt. His theory convicts him of this, let alone the facts.

And what is this theory? A theory of recapitulation which faces the child toward the past, which regards him as living through a set of relatively fixed conditions or strata, geology-wise. Hence, the lack of continuity of individual development, the lack of prospective reference. The abnormal instability of the highest stage is the penalty imposed because of the overrigidity of the preceding stages.

Mr. Hall affords the best example of this theory in his doctrine of elementary education, one of the chief points of which is clearly stated in the following sentence: "Just as about the only duty of young children is implicit obedience, so the chief mental training from about eight to twelve is arbitrary memorization, drill, habituation, with only a limited appeal to the understanding."<sup>1</sup> Mr. Hall faces the child post-simian-ward at this period. "It is the age of little method and much matter. The good teacher is now a *pedotrieb*, or boy-driver."

I offer by way of criticism neither a fact, a theory, nor a doctrine, but merely a speculation. Suppose that a child, say from eight to twelve, is subjected to just the sort of thing described above, at the hands of a skilful foreman or *pedotrieb*. Suppose he thus becomes equipped with a set of well-nigh automatic habits through arbitrary memorization and drill in the tools of calculation and language, and suppose he is well stored with information or "matter," with "only a limited appeal to the understanding." Meanwhile deeper and more instinctive functions ripen and assert themselves. What have you done but to rearrange with almost diabolical cunning a volcanic condition? You have built a hard crust of superficial habits, accomplishments, and "matter" over the gathering fires of further growth. You have been preparing for the violent upheavals and emotional instabilities that you come later to regard as typical of adolescence, but which are really typical only of a species of arrested

<sup>1</sup> Vol. II, p. 451.

development. You made "only a limited appeal to the understanding" from eight to twelve. And you expect a dawn of reason and intellectual balance at twelve? No, you expect what you are able to find exemplified in pathological cases—disintegrating emotional instability and fluctuation. You reap as you have sown.

The health, the sanity, the intellectual curiosity and hunger of normal youth have deeper roots.

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*The Making of Our Middle Schools: An Account of the Development of Secondary Education in the United States.* By ELMER ELLSWORTH BROWN. New York: Longmans, Green & Co. Pp. 547. \$3.

To the reviewer it is difficult to understand why this work of Mr. Brown has not received more attention—unless it be the very magnitude of the undertaking. Our secondary schools present the largest number of problems in organization and curriculum of any stage in present-day education. They deal with the most critical and important period in school life and have long furnished fruitful material for discussion. When a subject of such importance is shown by the attractive light of its historic setting in the logical, sane, and scholarly way that every theme which comes from the pen of Mr. Brown is handled, the result may well challenge the interest and careful criticism of all educators who look beyond the daily routine.

Moreover, it should be remembered that, while the secondary systems of Germany, France, and England have been most clearly and adequately described and discussed, there has never before been rendered a real connected account of our own high schools and academies. In fact, even a cursory reading of this scholarly book convinces one that, in spite of the rapidly changing principles and methods of secondary work, it will be considered the authority for the next quarter of a century at least, and must always remain the basis of any work written hereafter on the history of secondary education in this country. If the author had never produced anything else to entitle him to the prominent position which he holds among specialists in education, *The Making of Our Middle Schools* should have earned him this distinction.

*The Making of Our Middle Schools* seems to have been the outcome of articles contributed to the *School Review*, but it is far from being a mere compilation, filled with the repetitions, incongruities, and disconnectedness of most philosophical and educational books which have originated in this way. The logical method is revealed at every stage. After showing the impossibility of accurately defining the field of secondary education, because of its variations at different periods of our history and in different parts of the country, and describing the best efforts to define it that have been made from the standpoints of curriculum, psychology, biology, and sociology, Mr. Brown enters upon a historical account of the development of secondary schools in this country. He treats educational history as one side of the history of civilization and makes it apparent at every step how our secondary schools are an outgrowth of American life and ideals. Thus the modest, but appropriate, title of the book is justified.

Mr. Brown divides the history of secondary education in America into the periods of the Latin grammar school, the academy, and the modern high school. In this he does not draw hard-and-fast lines of demarkation, but shows how these different stages shade into each other as the occupations, ideals, and character of the people

have progressed or shifted. This division of our educational history, to be sure, is not original with Mr. Brown, for it was well worked out by Mr. Martin in his *Evolution of the Massachusetts School System*, and by others nearly a decade before; but nowhere is there so careful a statement of events or a more consistent sequence of narrative. Mr. Brown has been successful in avoiding the error of the educational writer who runs altogether to interpretation and generalization without due regard for the facts, and the equally common, though opposite, extreme of the chronicler who stuns the reader with his array of facts, but leaves him quite unenlightened as to their significance.

According to Mr. Brown, the period of the Latin grammar schools embraced the days of our educational apprenticeship to England, but the era in which the academy sprang up and flourished was a time of protest and reaction, while the high-school period has been a pure expression of American life and character with less regard to the attitude of Europe and her schools. Our Latin grammar schools were transferred to us in the colonial days almost bodily from the mother-country, and were aristocratic both in patronage and in curriculum. Through our isolation, material problems, and increasing diversity in religious doctrines, these schools began to decay somewhat before the middle of the eighteenth century, and were gradually succeeded by the more democratic, less sectarian, and generally broader academy, which found its first prototype in the similar institution of the English non-conformists. The struggles and sacrifices of a group of benevolent people in establishing and maintaining these academies in a thousand American communities, the broad catholic spirit of the instruction and methods, and the splendid set of schoolmasters who appeared under the system engendered a love and loyalty for this close corporation ideal, which kept the academy as the dominant type of American secondary school for half a century. But nothing could resist the growth of the secular spirit, and since Horace Mann finished his work, the modern high school, established first in Boston in 1821, has gradually come to the front. Nevertheless, as the representative of a different ideal, the academy has also remained, and a variety of other secondary agencies of a special nature have been called into existence to supplement the high school in meeting the changing needs and conditions that have arisen.

More interesting and valuable even than this historical basis is the statement of recent tendencies in our secondary schools and of the outlook for the future, which is contained in the last four chapters of the book. These tendencies are grouped under three heads: the better adjustment of secondary schools (1) to schools above and below them; (2) to the changing ideals of American life; and (3) to the individual capacities of the students. Mr. Brown believes that there are indications, as a result of these tendencies, that the high school will be brought more in touch with life, and that the demand for educational ideals rather than preparation for college will increase; that more thoroughly and scientifically trained teachers with greater ability and nobler aspirations will be forthcoming, and that more vital methods of instruction will appear; and, finally, that the spirit of democracy will be furthered by guarding against artificial standards, enabling each student to develop himself most effectively, and by promoting a wholesome interest in public affairs.

*The Making of Our Middle Schools* is a genuine product of the scientific method. Such a scholarly work must already have done much to acquit the subject of education from the common charge of being mere vapid enthusiasm without definite aim, scope, or method, and to raise the general tone and standing of those professing it as a specialty. If a few more such books can be produced, education will ere long secure its coveted recognition as a science.

Yet it is largely this very effort at accuracy in narrating all the facts that has brought about the only real defect in the book. The style is apt to be heavy in places, and, in spite of the evident sequence in treatment, sharpness of outline is not often secured. Even a scientific investigator should not find it necessary to present all that he has discovered. In revealing the truth, it often becomes his duty to forget or omit part of his results. In historical research this neglect of certain details is absolutely necessary, if we are to secure a proper perspective or genuine interest in the subject. Moreover, one reason for writing a textbook is to save the reader the necessity of wading through a mass of records himself. Of course, this book of Mr. Brown's comes far from giving the contents of all the documents that he found relating to the subject, but much that appears in the second, third, and fourth chapters, for example, might be eliminated for the sake of interest and clearness, without sacrificing anything essential to the narrative.

This encyclopedic characteristic of the book would seem to prevent it from being a good textbook for any except advanced students. It would be a great boon to teachers, if Mr. Brown would consent to cut the work down to less than one-half its present bulk, and thus make a standard text on American secondary education. This should not mean the abandonment of the present volume, since it must always remain the great reference work on the subject and a most valuable source-book for advanced students. And whether this condensation ever takes place or not, it will be conceded that the author has produced one of the few great works on the history of education in America.

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*A History of England.* By CHARLES M. ANDREWS. Boston: Allyn & Bacon, 1903. Pp. xx + 588.

*A Short History of England.* By EDWARD P. CHEYNEY. Boston: Ginn & Co., 1904. Pp. xvi + 695.

*The British Nation: A History.* By GEORGE M. WRONG. New York: D. Appleton & Co., 1903. Pp. xxxii + 616.

These three works constitute a welcome addition to the suitable school texts in English history. All have the qualities now deemed essential in such books, viz., prepared by an expert, and equipped with numerous authentic illustrations, carefully prepared maps, and a bibliography. They differ, however, in certain respects, so that a separate consideration appears useful.

Mr. Andrews' volume abounds in excellent illustrations, somewhat more than half being devoted to persons; and in numerous maps, notable among which are the series of seven illustrating England and France, 1154 to 1453, and three showing India in 1763, 1850, and 1903. Maps of Scotland, Ireland, and the Netherlands, with historical detail, are also given. A better equipment in this matter could scarcely be asked. The only notable omission is a map of physical feature sand natural resources. Indeed, this aspect of English history seems to be too lightly treated, there being scarcely any reference to the important part which geography has played. The most distinguishing feature of the book is the excellent bibliographical material which Mr. Andrews

has placed at the end of each chapter and in the footnotes. To quote from the preface: "The footnotes are designed to call attention to critical questions and problems in English history; the bibliographies, to furnish a comprehensive list of the best books, with a brief commentary." They are, however, "intended for the teacher's interest, and not for the pupil's." That the author has here rendered a distinct service will be acknowledged by all serious teachers. The footnotes refer largely to available collections of documents, such as Adams and Stephens, Gee and Hardy, Prothero, etc. There are in the neighborhood of a thousand specific references in the footnotes alone. An extended chronological and numerous genealogical tables complete the teaching apparatus. The language of the text, while technical in many places, is clear and straightforward, and not above the pupil of the later years of the high school. That the book discourages memorizing and necessitates thoughtful study is certainly not a drawback. Mr. Cheyney's book is likewise freely illustrated. There are, also, besides numerous political maps, a map showing the physical features and a chapter of the text devoted to the geography of England. The bibliographical notes have been prepared with reference to the pupil as well as the teacher, and are grouped into "General Reading," "Contemporary Sources," and "Poetry and Fiction." (The valuable little collection, "English History Told by English Poets," should, however, be credited to its real editors, Bates and Coman, not to "Baker and Cowan" [p. 144].) Appended to each chapter is a list of special topics with specific references for their preparation. A novel feature of this book is the frequent explanation in footnotes of such terms as might not be readily understood by a pupil; such, for example, as "canon," "heresy," "prorogation," "dissolution," "corporation," "litany," "chantry."

Mr. Wrong's volume, while comparatively weak in maps, has nearly three hundred illustrations of great value. A large proportion of them are devoted to manners and customs and historical scenes, and are made of greater value by the brief notes calling attention to the specific fact which the picture illustrates. Social life and development receive marked attention, seven chapters being devoted to such topics as "Pre-Norman Civilization in England," "English Civilization in the Thirteenth Century," "Social Change in the Nineteenth Century." Accompanying each chapter is a summary of European history for the corresponding period, and a summary of dates. The bibliographical notes are, on the whole, unsatisfactory. The references are few, general in character, and unaccompanied by critical comments; while practically no reference is made to source material, now so abundant for school use. It should be noted, however, that the illustrations go far toward supplying the deficiency.

All three books will do much to raise the standard of teaching in English history, and fortunate is the school which has access to numerous copies of each.

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*Núñez de Arce's Haz de Leña.* A Drama in Five Acts. Edited, with Introduction and Notes, by RUDOLPH SCHWILL. Boston: D. C. Heath & Co., 1903. Pp. i-xxxiii (introduction), 1-139 (text), 141-153 (notes).

Gaspar Núñez de Arce, the most distinguished and polished of contemporary Spanish poets, is the author of a high order of lyric verse, much of which reflects the

political vicissitudes through which his country has passed during the last fifty years. For he possesses the further distinction—so rare in a poet—of having won eminence not only in literary, but in public life, which has furnished him many themes for his lyre. His drama is less notable than his lyric verse. But it makes up in quality what it lacks in quantity, since to one production, *El Haz de Leña*, or "Bundle of Faggots," is freely conceded the rank of the finest Spanish play of the last century. Its presence among us in a school edition is desirable and welcome.

The play is laid in the reign of Philip II, the monarch whose name is identified with the halcyon days of Spanish world-dominion during the sixteenth century. It takes its name from the test of orthodoxy zealously offered by Spanish nobles, at the burnings of heretics, by helping fetch on their backs the fuel needed for the consummation of the pious ceremony. The theme deals primarily with the legend of the enmity between Philip and his son, Don Carlos, a conflict popularly supposed to have been characterized by great harshness on the part of the father toward the son, and reported to have ended in the murder of the latter at the instigation or by the direct act of the former. The legend has a lugubrious fascination, and is sufficiently shrouded in obscurity to give plenty of scope to the imagination. In this way it has furnished not a little material to be worked up into literary shape according to the fancy of the writer. But the trend of reputable historical belief is to reject the theory of such a revolting tragedy as a popular myth, ascribing its origin to the illiberal interpretation of the restraint in which a disillusioned and hard-hearted monarch-father was forced to keep an irresponsible son, now admitted to have been a degenerate, and oaf, devoid of all claims to sympathy—a pitiable being, infirm in body and mind, and with the most bestial and depraved tastes.

Such data as these do not furnish a favorable opportunity to any literary treatment that does not distort the originals to unrecognizable forms. The writer has most ably acquitted himself of the difficult task, preserving the salient traits of his actors, but toned down and adjusted in a way to enlist our keen sympathy for them all, rather than to excite the aversion for some and the detestation for others which strict adherence to fact or legend would stir up within us. Don Carlos is brought before us as a frail and infirm young man, unfit for his exalted station, yet often capable of fine sentiments and high ideals, and bitterly conscious of his grievous shortcomings. He excites our pity as a sentient creature expiating the sins of a long line of vicious ancestors. With a feverish restlessness, inherent in an unbalanced organism, he chafes under enforced inaction, and in a wild grasp at liberty he plots against his father—with the Netherlands heretics. This is the unpardonable crime for which, in Philip's eyes, there is no atonement save by fire, and to this end he would willingly contribute his *haz de leña*, not sparing his own son. The estrangement between father and son is thus irreconcilable; but the latter, worn out by his excesses, is snatched away by a premature death, thus relieving the situation of a terrible tension.

The author's presentation of the grim monarch is a strong one, and in harmony with the best interpretation of the traditions associated with his memory. He is shown as the cold, unrelenting, but conscientious autocrat, taking himself and his mission over-seriously. His political ethics are inspired by a Draconian ideal of justice, which accepted only religious orthodoxy as the touchstone of all human actions. This relentless rigor in adherence to the letter of the religious law—which has been the dominant trait of the Spanish character within historical times—the *Haz de Leña* admirably portrays. The play is the embodiment of this spirit, the gloom and severity

of which provide the chief dramatic quality for the action, expressed in the highest order of dramatic versification.

The editorial workmanship is good. The Introduction is full and well distributed, with subdivisions biographical, historical, and prosodic. The latter is, however, all too brief for even the most summary sketch of the leading principles of Spanish versification. It could have been advantageously amplified to the extent of several more pages, making for a more satisfactory fulness in the presentation of the subject. For example, we are informed of the different verse-groups occurring in the play, as the *romance*, the *redondilla*, and the *quintilla*, but the divers metrical combinations, by which Spanish verse correspond to English forms, are quite ignored. We are told (p. xxvii) what an *esdrájulo* verse is, but nothing is said about the *llanos* and *agudos*.

The edition is commendably free from error. There is a typographical blunder on p. xxv, where the last seven lines are prematurely introduced; and an error at the top of p. 115, II for IV. Verse 252 is improperly spaced (for example, cf. verse 417 below, and *passim*).

R. E. BASSETT.

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## NOTES

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### INTERNATIONAL CONGRESS OF CHILDHOOD AT LIÈGE

In connection with the international exposition to be held at Liège, Belgium, from April to November, during the coming year, it is proposed to hold an International Congress of Childhood from September 17 to 20, inclusive. The purpose of the congress is to consider the best means of promoting the physical, intellectual, and moral development of the young in the home, the school, and society.

The congress will be organized in four sections, as follows: (1) Education of Children; (2) Study of Children; (3) Care and Training of Abnormal Children; (4) Parents' Associations, Mothers' Clubs, and Other Supplementary Agencies for the Improvement of Youth. Membership in the congress is solicited from educational institutions and associations, societies for the protection and guardianship of youth, students of the psychology of childhood, teachers, philanthropists, and parents. The membership fee (ten francs) may be sent direct to the secretary of the congress, Louis Pien, No. 44 Rue Rubens, Brussels, Belgium, or to any member of the American committee.

To promote an interest in the Liège International Congress in the United States, the commissioner of education has appointed the following American committee: Chairman, Professor M. V. O'Shea, University of Wisconsin, Madison, Wis.; secretary, Professor Will S. Monroe, State Normal School, Westfield, Mass.; Hon. Alfred Bayliss, state superintendent of public instruction, Springfield, Ill.; Miss Ellen M. Henrotin, Chicago, Ill.; Professor A. Caswell Ellis, University of Texas, Austin, Tex.; Hon. Richard S. Tuthill, Chicago, Ill.; Professor William H. Burnham, Clark University, Worcester, Mass.; Mr. Charles W. Birtwell, Children's Aid Society, Boston, Mass.; and President E. G. Lancaster, Olivet College, Olivet, Mich.

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Professor John Adams, of the University of London, is to deliver a course of lectures in the School of Education of the University of Chicago during the Summer Quarter. Professor Adams has long been regarded as one of the most brilliant, as well as one of the soundest, men engaged in educational work in England. In this country he is chiefly known as the author of an exceptionally stimulating book upon *Herbartian Psychology Applied to Education*, published four or five years ago by D. C. Heath & Co., Boston.

